

ANTISEPTIC MIDWIFERY

HENRY J. GARRIGUES

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PRACTICAL GUIDE

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ANTISEPTIC MIDWIFERY

IN HOSPITALS AND PRIVATE PRACTICE.



— B Y —

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DETROIT, MICH.

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CHAPTER I. INTRODUCTION.

PUERPERAL SEPTICÆMIA DUE TO A POISON PROBABLY PRODUCED BY MICROBES.—The now well-ascertained fact that in almost all cases, by the local use of certain drugs, we can prevent puerperal septicæmia, and if it has made its appearance, most effectually combat it, shows that this disease is due to a poison, which enters the genitals as such, or is produced there by a substance coming in from without.

It can furthermore be looked upon as almost sure that the producers of this poison are certain microbes, microscopical fungi, which have been found on the wounds of the genital canal, in the blood circulating in the veins of the living patient, and, after death, in almost all internal organs of the great cavities, exudations, etc. The most dangerous of them seem to be the round micrococci in chain-like groups, but beside them are found single and double round micrococci, and the common rod-shaped bacteria of putrefaction. Chains of micrococci similar to those of puerperal septicæmia are found in erysipelas, scarlet fever, diphtheria, and pyæmia, and so far it has not been possible to differentiate them in these clinically different diseases.*

* See Lomer: Relations between Micro-organisms and Puerperal Fever, in Am. Jour. Obst., 1884, Vol. XVII, p. 673, et

SOURCES OF THE POISON.—The poison causing puerperal septicæmia may be derived from different sources, such as patients affected with the same disease; patients suffering from suppuration or decomposition of tissue; patients with zymotic diseases; and from putrefying substances.

The contagiousness of the disease has been proved beyond a doubt by an enormous amount of evidence.

The origin from suppuration was pointed out by Semmelweis,† in 1847, and in this country the case of Dr. Rutter, of Philadelphia, who suffered from ozæna, and had 45 cases of puerperal septicæmia in his own practice, in one year, is one of the most remarkable instances of this kind.‡

Semmelweis likewise showed that the disease in most cases was due to infection brought by students engaged in autopsies. The emanations from the decaying body of a dead rat was found, some years ago, to be the cause of a small local epidemic in the New York Infant Asylum.

seq. A. H. Freeland Barbour: Pathology of the Post-partum Uterus, in Edinburgh Med. Jour., Nov. and Dec., 1885, reprinted in the New York Medical Abstract, Dec., 1885, Vol. V, p. 446.

† Semmelweis, in Wiener Zeitsch., Dec., 1847, Schmidt's Jahrb., 1848, Vol. 58, p. 196.

‡ Playfair: Science and Practice of Midwifery, London, 1876, Vol. II, p. 314.

The rôle certain zymotic diseases, especially erysipelas, scarlet fever, diphtheria, and typhoid fever play in the production of puerperal infection, is not yet clinically settled, but there is certainly evidence enough brought forward in support of the assertion to make it a duty for the physician to use the greatest precaution in midwifery cases when he has to deal with any of these diseases.

NEARLY ALL INFLAMMATORY PUERPERAL DISEASES PROBABLY DUE TO INFECTION.—Not only septicæmia, but nearly all puerperal affections of an inflammatory character, such as cellulitis, metritis, and local peritonitis, are probably due to infection, the proof of which is, that they almost disappear, and entirely change character when the antiseptic occlusion treatment, recommended on the following pages, is used.

If no poison from without found its way into the body of the pregnant or puerperal women, none of them would be sick after delivery.

WAYS BY WHICH THE POISON ENTERS.—In the vast majority of cases the infection takes place by absorption through the wounds of the genital canal, but in my opinion it is too exclusive to say, as many do, that it is the only way. Our modern discoveries ought not to make us forget the facts observed and recorded by our predecessors. Depaul* has described

* Depaul, in *De la fièvre puerpérale*, communications à l' Académie Impériale de Médecine, Paris, 1858, p. 31.

the case of a pupil midwife in the Maternity Hospital of Paris, who, whilst washing the genitals of one of her patients suffering from grave puerperal fever, felt instantly an unpleasant sensation, was taken sick the same evening, and died on the third day "with all the symptoms of the most characteristic puerperal fever." The post-mortem corroborated the diagnosis, and she was found to be a virgin, and not in a menstrual period. Such a case may be unique, but it ought, nevertheless, to make us a little reserved in our expressions about the way the poison of puerperal septicaemia enters the system. In this case, it seems fair to admit the possibility of an absorption through the mucous membrane of the lungs, however rare this way of transmission may be, and however little it therefore ought to influence our preventive measures.

Credé * has reported that during an epidemic of puerperal fever in Leipzig, out of ten children who died of sepsis, one only had been infected through the navel. In the other nine infection seemed to have taken place through the mouth, where gangrenous aphthæ were found.

HOW THE POISON IS CARRIED TO THE PATIENT.

—Mostly, the poison is brought into direct contact with the genitals by the hands of doctors, midwives, or nurses, by instruments, sponges, rags, oakum, cot-

* C. S. Credé, in *Archiv für Gynäkologie*, 1884, Vol. xxiii; No. 1, p. 77.

ton or other substances, but it can quite as well be suspended in the air of the wards. That is the only way in which I can explain the fact that, before the new treatment to be described on the following pages was introduced in Maternity Hospital, every time a ward had been thoroughly fumigated with sulphur, the patients were free from fever for the first week. Busch found, likewise, that he prevented puerperal fever in the Berlin Lying-in Hospital by heating the rooms before use to 60° R. (167° F.)* Nay, the mere introduction of better ventilation has in many lying-in hospitals had the effect of considerably diminishing disease and death. These facts ought, therefore, to teach us not to concentrate our whole attention exclusively on the disinfection of hands, instruments, etc., but also to take measures to protect the lying-in woman by divers means, to be explained hereafter, against the air in the room in which she is confined, or passes her lying-in period.

TIME OF INFECTION.—The infection will, of course, be most likely to take place during the manipulations of delivery, but it may likewise occur before and after. Thus we sometimes, although rarely, find fever before delivery, and, on the other hand, septicæmia may break out at a period when, as a rule, all danger is passed.

SUSCEPTIBILITY OF PUERPERAL WOMEN.—The

* Busch, in Neue Zeitschr. f. Geburtskunde, vol. xxxii, No. 3, Schmidt's Jhrb. 1853, Vol. 77 p. 40.

infection is much favored by the peculiar susceptibility of the puerperal woman. The rapid involution going on in her genitals and adjacent parts, constitutes a strong current in the direction of her skin, her kidneys, her lungs and her heart, organs destined to circulate and throw out the waste material of her body. Thus a real suction is formed by which the septic material is likely to be carried from the genitals to the inner organs. The great irritability of the nervous system developed during pregnancy, has an unmistakable effect in regard to the development of septicæmia, which it is more difficult to account for since we know that the disease is in reality caused by micro-organisms brought into the genitals of the patient. But as every muscular contraction, and all the secretory functions, are controlled by nervous action, we can imagine how even the propagation and the distribution of microbes through, and their elimination from the body may be influenced by the condition of the patient's nervous system.

MORTALITY FROM PUEPERAL SEPTICÆMIA.— Before the use of antiseptics in midwifery, the death rate in hospitals due to puerperal septicæmia was enormous. The palatial Lariboisière Hospital, in Paris, had an average mortality of almost eight per cent. of lying-in women.*

* *Gazette des Hôpitaux*, 1866, p. 151.

In one of the services of the large lying-in hospital of Vienna, the average mortality for the six years 1841 to 1846, was almost ten per cent.* In the Maternity Hospital, of Paris during five years, 1860 to 1864, it averaged eleven per cent.†

Now, these same institutions, since the adoption of proper antiseptic measures, have a mortality of about one per cent., or even one-half of one per cent.

Outside of hospitals the mortality from puerperal septicæmia is likewise very high.

Careful statistical researches have shown the enormous death-rate caused by this disease in whole cities and countries. During seventeen years, 1861 to 1877, there was, in Berlin, one death from puerperal fever in every 178 confined women, and one death in child-birth in every 152 confinements. During sixty years, 1816 to 1875, there died in Prussia 0.8 per cent. of all confined women, or, more exactly, 8,322 out of every million.‡

During seventeen years (1867-1883) the mortality in the cities of Denmark due to puerperal fever, among women between 15 and 45 years of age, was

* Semmelweis Die Aetiologie, der Begriff und die Prophylaxis des Kindbettfiebers. Wien, 1861, p. 3.

† Billet: De la fièvre puerpérale et de la réforme des Maternités, Paris, 1872, p. 59.

‡ Die Arbeiten der Puerperalfiebercommission in Berlin, Stuttgart, 1878, pp. 28 and 81.

11 per cent. of the total mortality from all causes, or one death in nine was due to puerperal fever. In consequence of the use of antiseptic measures the mortality has diminished considerably in that country. Thus during the first ten years of this period there was one death in every 165 confinements; during the last seven years only one in 300. Still, with the sole exception of phthisis, puerperal fever is the most fatal disease in women between 15 and 45 years of age. If we limit the investigation to the age between 25 and 35 even one death in six is due to puerperal fever.*

In New York City there were in the four years (1880-1883) delivered 120,418 women, of which 1,005 died of puerperal fever, or one in 120.†

The data upon which the census of 1880 is based in regard to medical questions, are necessarily so defective that it is impossible to find out even approximately the mortality of puerperal fever in the whole country, but there is no reason to think that it should differ materially from that in Prussia and Denmark.

Before the introduction of antiseptic measures,

*E. Ingerslev, in *Compte rendu des travaux de la Section d' Obstétrique et de Gynécologie de la 8e Session du Congrès international*, Copenhague, 1884.

†Hanks, in *Med. Record*, February 16, 1883, vol. xxv., p. 191.

puerperal fever used to reign in so-called epidemics. With our present knowledge we can, as Fritsch aptly puts it,* as little speak of an epidemic of puerperal fever as of an epidemic of gun-shot wounds the day after a battle. From properly conducted hospitals the "epidemics" have altogether disappeared, and outside of hospitals they are easily traced to a doctor or a midwife.

The very narrow limits drawn by the publisher do not allow me to give more than these almost aphoristic hints about the origin and importance of puerperal septicæmia, but without these few remarks about the nature of that disease the following pages would to many not be comprehensible.

HISTORY OF ANTISEPTIC MIDWIFERY.—Still briefer must I be in indicating the historical development of antiseptic midwifery. The first who understood the septic nature of puerperal fever, and instituted an antiseptic prophylaxis (by means of chlorine) was Semmelweis, of Vienna, in 1847. Still, our present highly developed antisepsis is not derived in a direct line from him. It was first when Lister, building on the researches of Pasteur, had created antiseptic surgery (1866) that Stadfeldt (1870)† tried

*Fritsch: *Grundzüge der Pathologie und Therapie des Wochenbetts*, Stuttgart, 1884, p. 35.

†Stadfeldt: *Des Maternités*, Copenhaque, 1876, p. 12.

to adapt his treatment with carbolic acid to midwifery,* and he was soon followed by Bischoff, of Basel,* and Fritsch, of Halle.†

From that time the use of carbolic acid in obstetric practice spread rapidly over Europe and America.

Another period was inaugurated when Tarnier introduced bichloride of mercury, which he recommended in a paper read before the International Medical Congress, in London, 1881, and this treatment received new impulse through the experiments of Koch,‡ of Berlin, and the introduction of it into surgery by Schede,§ of Hamburg.

This is now the chief drug used, but some obstetricans yet prefer carbolic acid. In the following pages will be found an account of my experience with both, and of my way of using the corrosive sublimate.

I refer especially to the experience in the New

*Bischoff: *Zur Prophylaxis des Puerperal fiebers*, Basel, 1876

†Fritsch: *Ueber das Puerperalfieber und dessen locale Behandlung*. Volkmann's klinische Vorträge, No. 107, Leipzig, 1876.

‡Robert Koch: *Ueber Desinfection*, in Mittheilungen aus dem kaiserlichen Gesundheitsamte, 1881, vol. I, p. 244-282.

§Kümmell: *Ueber eine neue Verbandmethode und die Anwendung des Sublimats in der Chirurgie*, in Langenbeck's Archiv vol. xxviii, No. 3. Centralbl. f. Gynäkologie 1883 vol. vii, p. 465.

York Maternity Hospital, because a large hospital is the true place in which to test the value of an anti-septic, and that hospital presents peculiar features which predispose the patients to puerpural infection.

CHAPTER II

PREVENTION OF PUERPERAL INFECTION IN THE NEW YORK MATERNITY HOSPITAL.

The first time I visited the lying-in wards of Charity Hospital (which later became Maternity Hospital) was in the winter of 1876-77, when I examined all the lying-in institutions of the city, in order to collect material for my paper on "Lying-in Institutions, especially those of New York."* Dr. D. A. Kitchen at that time Chief of Staff, informed me that the physicians, before every examination, washed their hands with a solution of carbolic acid, and that the same was used for vaginal injections three times a day in every confined woman, and oftener when the temperature ran high. These for that time excellent measures, must, however, subsequently have been abandoned, for when, four years later, I was appointed Visiting Obstetric Surgeon to the Maternity Hospital my colleague who showed me round, declared that he did not think it feasible to carry out the antiseptic treatment in the hospital, and that therefore he had not tried it. As I, however, was in the habit of using antiseptic measures in my private practice, and was unwilling to take the responsibility of conducting a

*Transactions of the American Gynecological Society.
Vol. II., 1877.

large lying-in service without them, I introduced the following treatment. Before and after every vaginal examination the doctors and nurses washed their hands in a 2-per-cent. solution of carbolic acid, which fluid was likewise used for a vaginal douche given before and immediately after delivery, and morning and evening during the first eight days of the lying-in-period. Instruments were disinfected with a 5-per-cent. solution of the same drug. Whenever it had been necessary to enter the uterus with hand or instruments, an intra-uterine injection of about a quart of the two-per-cent. solution was given. In all the cases the genitals were covered with a compress dipped in oil with ten per cent. carbolic acid, kept in place by means of a pad of oakum inserted between the thighs.

Under this treatment about two hundred women were delivered during my first service of six months. Eight of the patients died, a total mortality of 4 per cent., and the cause in all cases was septicæmia, except in one patient who died in the waiting ward, of thrombosis of the basilar artery.

As these figures clash with some made public for the same period, a few remarks on the subject may be called for in this place.

In their eleventh annual report of the "New York County Visiting Committee for Bellevue Hospital and other Public Institutions" presented to the State Charities Aid Association, May 3, 1883, the ladies

composing that committee, without ever having conferred with the Board of Obstetric Surgeons to Maternity Hospital, found it proper to make the following assertion, viz:

“MATERNITY SERVICE—CHARITY HOSPITAL.—

During the past twelve months there has been a radical change of administration in this department, and the committee regrets to be obliged to give a report which is much less satisfactory than that of last year.

“From April 1, 1881, until April 1, 1882, the Chief of Staff was held directly responsible for the transfer and care of patients, the visiting physicians only calling occasionally, when notified that their services were needed. During that time there were four hundred and eleven births, and only two deaths of mothers, less than one-half of one per cent., a rate which must be considered as extraordinarily low under any circumstances, and the more remarkable when it is remembered that many of the patients are mere wrecks of dissipation and disease.

“On April 1, 1882, the Board of Visiting Physicians assumed direct control of this service, one especially of their number being zealous and constant in his attendance. From April 1, 1882, till April 1, 1883, the record shows four hundred and thirty-seven confinements and twenty-three deaths of mothers, a death-rate of 5.26 per cent.”

An examination of the Visiting-Book shows that between April 1, 1881, and December 1st, of the

same year, my colleague, Dr. P. F. Mundé visited Maternity Hospital seventeen times. From December 1, 1881, till April 1, 1882, I was on duty, and visited forty-five times. Thus during the year in which the results are claimed to have been so wonderfully good, and credited to the Chief of Staff, the hospital was under the constant supervision of the Visiting Surgeons, and during the last four months I visited it on an average of three times a week. Thus, if credit were due to anybody, I should, in justice, come in for my share of it, instead of being pointed out as one who was especially zealous and constant in his attendance, with the unenviable result of having a more than ten times higher mortality than his subordinate had had, for the dangerous person referred to, can not be anybody else than myself.

If the authors of that report had applied to the proper authorities, either the Commissioners of Public Charities or the Board of Obstetric Surgeons, they might have learned that they were entirely mistaken.

This fable of the two deaths in a year went, at the time, from the Report of the Visiting Committee into the daily newspapers, and has finally found its way, in a mitigated shape, into a medical journal. In the Canadian Lancet, published at Toronto, September, 1885, Vol. XVIII, No. 1, p. 25, in a leading article headed *Meddlesome Midwifery*, is found the following passage, viz: "In the Maternity Hospital, New York,

out of 570 deliveries the death-rate was 2.67 per cent. A few years afterwards, under 'reform,' the death-rate rose to 6.67 per cent. Thus, in 1881, out of 202 selected cases twelve died. Of 423 cases occurring from April, 1881, to April, 1882, but two deaths took place from puerperal fever, and the whole mortality was greatly reduced. The last cases were all strictly treated on the non-interference plan. Previous to the adoption of 'reform,' the death-rate was not above the minimum in the New York State Hospital for Emigrants. A year since, a so-called 'reform' was instituted there, the prophylactic injections and complicated manipulations were introduced, and with the direct and immediate effect of increasing the mortality-rate, which became alarmingly high."

It would be difficult to find another statement apparently so authoritative, and still so absolutely wrong.

The editor of the paper is, of course, not to blame. He uses seeming facts to prove his theory, but who furnishes these seeming facts? The figures are as precise as if they were obtained from the officials of the hospital, and still the whole passage from one end to the other is a tissue of misstatements. Everybody has, of course, the right to deprecate anti-septic midwifery as long as he has not been convinced of its superiority, but our experience in Maternity Hospital can certainly not be used for proving its inefficacy, still less its deleterious effects.

First of all, we will throw a little light on that mysterious period, from April 1, 1881, until April 1, 1882, when under the supposed régime of the Chief of Staff there were said to have been only two deaths of mothers. It has been quite difficult to get at the facts, the books of Maternity and Charity Hospitals being so intermingled that one could not see what became of the patients. Still, the Commissioners of Public Charities wanted a report from the Board of Obstetric Surgeons on that report of the Visiting Committee. By going through the register of autopsies of Charity Hospital and several other books, the Board succeeded in collecting no less than nine deaths, that is to say, *four and a half times as many as had come to the knowledge of the Visiting Committee*, during the period in question, and it is by no means sure that this number represents the total mortality, as patients may have been transferred from Maternity to Charity Hospital, and their death registered in such a way that it could not be seen that they were originally admitted to Maternity Hospital, and confined there.

The nine cases found were the following:

1. April 16, 1881, Lottie Phrie. Purpura hæmorrhagica. Asthenia.
2. August 1st, 1881, Mary Corbett. Puerperal septicæmia.
3. August 21st, 1881, Ernestine Haberman. Peritonitis. Collapse.

4. September 22d, 1881, Hattie Moore. Diarrhoea. Congestion of lungs. Syncope.
5. November 3d, 1881, Jane Pierson. Acute peritonitis. Cellulitis.
6. January 14, 1882, Kate Welsh. Thrombosis. Pyæmia.
7. February 2d, 1882, Mary Shepard. Puerperal peritonitis. Shock.
8. March 5th, 1882, Margaret Anderson. Puerperal peritonitis.
9. March 20th, 1882, Ellen Rock. Mammitis. Septicæmia. Pleuritis. Peritonitis. Pericarditis.

It will appear from this list that there were nine deaths, and that the causes in all cases, under different names, is referable to infection.

It is necessary to give these, in themselves uninteresting details, because on the following pages I use the experience gained in Maternity Hospital to show the high value of strict antisepsis.

During my first service of six months, there reigned what, at that time, was looked upon as a not unusual morbidity and mortality in the hospital. Still, not satisfied with the general condition of the patients, when I went on duty again, on October 1, 1882, I wanted to try if perhaps the vaginal injections given by nurses who often came directly from the wards of Charity Hospital, did more harm than good. I therefore abolished them, and they were not used in normal cases during the following six months.

During that period, the preventive measures consisted only in dusting the outer parts with a mixture of one part of salicylic acid with four parts of starch, and inserting a pad of oakum between the thighs in front of the vulva.

During this period of non-interference both the morbidity and the mortality increased very much. One hundred and ninety-two women were delivered, fifteen of whom died, a mortality of 7.8 per cent. Of these fifteen deaths, six were due to non-infectious causes (Catharine Rooney, ante-partum haemorrhage, Cæsarian section, shock ; Nellie Smith, ante-partum haemorrhage ; Margaret Kiernan, double pneumonia at time of delivery ; Bridget McGowan, traumatic cerebral haemorrhage ; Kate Russell, purpura haemorrhagica, post partum haemorrhage ; Mary Dillon, eclampsia) which still leaves nine, or 4.69 per cent., referable to infection.

The bad condition of the hospital at that time becomes still more apparent if we examine the frequency of disease after delivery. It used to be rather an exception than the rule to see a perfectly normal lying-in period. Of the 192 women delivered, 46, or almost one in four, were seriously ill ; 39, or almost one in five of the whole number, suffered from inflammatory puerperal diseases, as evidenced by the following table, viz:

A. INFLAMMATORY PUERPERAL DISEASES.—

- (a.) Diphtheritic vulvitis, colpitis or metritis, 19 cases (3 of these developed peritonitis; 4 died).
- (b.) General peritonitis, 10 cases (3 of them had diphtheritic inflammation; 7 died).
- (c.) Metritis, 10 cases (6 of them had *dissecting metritis*; * none died).
- (d.) Perimetritic inflammation, 2 cases (1 local peritonitis, 1 parametritis; none died).
- (e.) Erysipelas, 2 cases (1 with mammary abscess, 1 with diphtheritic inflammation of the genitals; both died).
- (f.) Pleuritis, 1 case, recovered.
- (g.) Mammary abscess, 5 cases (1 developed gangrenous erysipelas and died).

B. NON-INFLAMMATORY PUERPERAL DISEASES.—

- (a.) Shock after Cæsarean section, 1 case, died.
- (b.) Uterine haemorrhage, 3 cases, including the previous one; all died.
- (c.) Cerebral haemorrhage during delivery, 1 case, died.
- (d.) Mania, 1 case, recovered.
- (e.) Uræmic coma, 1 case, died.
- (f.) Eclampsia, 1 case, developed diphtheritic inflammation, recovered.

*See Garrigues: *Dissecting Metritis*, in the New York Medical Journal, December, 1882, Vol. xxxvi, p. 587; Archives of Medicine, April, 1883, Vol. ix, No. 2, and the Medical Record, December 15, 1883, p. 664.

C. NON-PUERPERAL DISEASE. — Double pneumonia at time of delivery, died.

During the next six months, April 1st till October 1st, 1883, there were delivered 237 women, with nineteen deaths, or 8 per cent., seventeen of which, or 7.17 per cent. of the number of deliveries, were of septic nature. Of the fifty-one women delivered during the last month, ten, or *one out of every five died*, and eight of them, or 15.69 per cent., succumbed to infection.

The time seemed to have come to try if real anti-septic treatment could help us out of this fearful condition. When, therefore, I again went on duty on the first of October, 1883, I had laid a detailed plan how to grapple with the foe who seemed to become more and more victorious in his attempts on the health and the life of our patients.

A peculiar feature of Maternity Hospital is its intimate connection with Charity Hospital, a large general hospital in which are treated all medical and surgical diseases. Between seventy and eighty women expecting their confinement within a period varying from four months to a few days, occupy three "waiting wards" in Charity Hospital. When labor pains set in they are transferred to the "pavilions," two small wooden buildings, each of which contains two large and two small wards, but one of the large and two of the small are used as dormitories for the pupils of the training school for nurses. As soon as feasible,

the patients are therefore returned to the main building, and placed in the so called "convalescent ward," which can accomodate twenty-four patients. When, at times, puerperal infection was prevalent in the pavilions, the whole service used to be transferred to a ward in the main building, where the results became still worse, until the pavilions had been disinfected, and could be occupied again.

The first thing I did, was to divide the service in the pavilions into two departments, one for the well, the other for the sick patients, half a dozen of whom were left over, seriously ill, from the previous service. Two large wards with accommodation for nine patients each, and a small one, which shelters six, besides the delivery room, were reserved for the normal cases; a large ward and two tents were set apart for the sick puerperæ. Each department had separate doctors, nurses and utensils, so that I was the only one that had to do with both departments.

Rapid alternation in the use of the wards occupied by the well patients, was insured by keeping each well patient eight days only in the pavilions, and transferring her on the ninth to the convalescent ward. When the last patient in a ward had reached her ninth day, it was under all circumstances emptied, and if, for some particular cause it seemed desirable to make an exception from the rule, so as to keep a patient a few days longer in the pavilions, she was

transferred to the ward then in use for the last confined women.

If a patient, either in the pavilions or in the convalescent ward, showed any sign of infectious disease, she was immediately transferred to the department for the sick puerperæ.

The doors between the wards were locked, and the chinks filled with tow, and pasted over with paper, or later sealed with adhesive plaster. Thus all inter-communication between the wards was rendered impossible, and the doctors and nurses were obliged to pass through the open air, in going from one to the other.

Doors leading to water-closets were furnished with springs, so as to close automatically, and the windows in the water-closets were nailed, in order to prevent them from being closed.

As soon as a ward was empty it was fumigated with sulphur, twenty pounds to the smaller, thirty to the larger ones. After that, the windows were kept open day and night, until the ward was needed again.

In order to avoid the introduction of infection by people coming from houses in which there were persons suffering from diseases which might endanger our patients, these were not allowed to receive any visitors, a rule which even applied to clergymen, except in cases which threatened to end fatally.

It was already an old rule that doctors and nurses employed in Maternity Hospital were forbidden to

enter the wards of Charity Hospital or the dead house, and as the presence of the doctors of Charity Hospital often coming directly from autopsies or septic patients to witness operations at Maternity Hospital had proved disastrous, this custom had to be discontinued.

All these hygienic measures may have been more or less instrumental in securing the desired effect, but by far the most important link in the whole system was the introduction of bichloride of mercury as an antiseptic. This was used for the room and furniture, for the doctors and nurses, and for the patient herself, in the following way.

When a ward had been fumigated and aired, and the floor scrubbed with soap and water, it was subsequently washed with a solution of bichloride of mercury (1 to 1,000), and so was every piece of furniture, bedsteads, tables, chairs, etc., and the bedsteads were provided with fresh bed-clothes and new straw. All linen and blankets from sick women were immersed for one hour in casks with undiluted solution. Four times a day the floors were sprinkled with the same.

At the beginning of each labor, doctors and nurses washed their hands with soap and water, using stiff nail brushes, and after that in the solution of 1 to 1,000, to which, in cold weather, a small quantity of hot water was added. If more than one patient was in labor at the same time, the same precautions were used before going from one to the other. Besides

this, the hands were held for a minute or more in the warm solution, kept for that purpose in a particular basin at the side of the bed, each time before the genitals were touched. No lubricant was used other than the fluid adherent to the fingers, except in operations in which the whole hand had to be introduced into the genital canal, or the forceps was to be applied. For this purpose a mixture of equal parts of glycerine and water, with two per cent. carbolic acid, was used, and later, pure glycerine with three per cent. carbolic acid.

In order to limit the danger of infection by vaginal examinations as much as possible, no nurses were allowed to make any, except the one in charge of the waiting ward, and the head nurse in the pavilions, and even these were directed not to repeat them more frequently than necessary for notifying the doctors. The latter were urgently requested not to introduce their finger into the womb in common cases, but to be satisfied with such information as is derived from abdominal palpation, and the examination of the part presenting at the external os.

When a patient was taken in labor, she was given an enema and a bath, and her abdomen, genitals, buttocks and thighs were carefully washed with a lukewarm solution of bichloride, 1 to 2,000. Two quarts of the same fluid were injected into the vagina by means of a fountain syringe, consisting of a glass jar, a rubber tube, and a straight glass tube. In protracted cases

these injections were repeated every three hours. The rubber sheet lying under the cotton sheet of the delivery bed was washed with the undiluted solution, 1 to 1,000, immediately before placing the patient on the bed.

When the foetus appeared at the vulva, a piece of lint, soaked in solution (1 to 2,000) was applied to it and kept there all the time, in order to prevent the surrounding air from being pumped into the vagina by the alternate progression and recession of the presenting part. After the expulsion of the child, the genitals were kept covered with a similar compress until the after-birth had been expelled, and the patient had been washed, and was ready for removal to the ward.

The placenta was expressed by Credé's method,* so as to avoid introducing fingers inside the rima pudendi, after the delivery of the child. If, in exceptional cases, it became necessary to do so, the vagina was washed out with the solution of bichloride (1 to 2,000), otherwise not.

Acting on the same principles, intra-uterine injections were only used when the hand or instruments had been introduced into the interior of the womb, or in case of the birth of a macerated child.

* See Garrigues: The Removal of the After-birth, in American Journal of Obstetrics, 1884, Vol. XVII, No. 5, p. 486.

If part of the placenta or membranes were retained in the womb, the accoucheur was to remove them, even if it should be necessary for that purpose to introduce the whole hand into the womb.

For the intra-uterine injection we used in the beginning from two to four quarts of a 1 to 2,000 solution, but later the amount has been reduced to one quart or three pints, and the strength to 1 to 4,000. It was taken so hot that the hand could just be held in it—110 to 215° F.—the heat working as a powerful stimulant to insure contraction, close the vessels, and arrest haemorrhage.

For these injections I had made glass jars (plate, 1), with rubber tubing, and a tube (plate, 2) of very thick glass.

After the removal of the secundines the patient was washed with the solution (1:2000), and the vulva covered with an *antiseptic occlusion dressing* (plate, 3) consisting of: (1.) A piece of lint six by eight inches, folded lengthwise, so as to be three inches wide; (2.) a piece of oiled muslin, nine by four inches; (3.) a large pad of oakum; (4.) a piece of muslin, eighteen inches square. The lint was wrung out in the luke-warm solution of bichloride (1:2000), and carefully applied over the vulva, from one genito-femoral sulcus to the other. The oiled muslin was washed in the same solution, and applied over the lint, bending the edges forward on the inside of the thighs. The oakum was put inside of the common muslin, which

was folded diagonally, so as to form a kind of boat, five inches wide, and fastened tightly to the binder (plate, 4) by means of four pins in front and two behind.

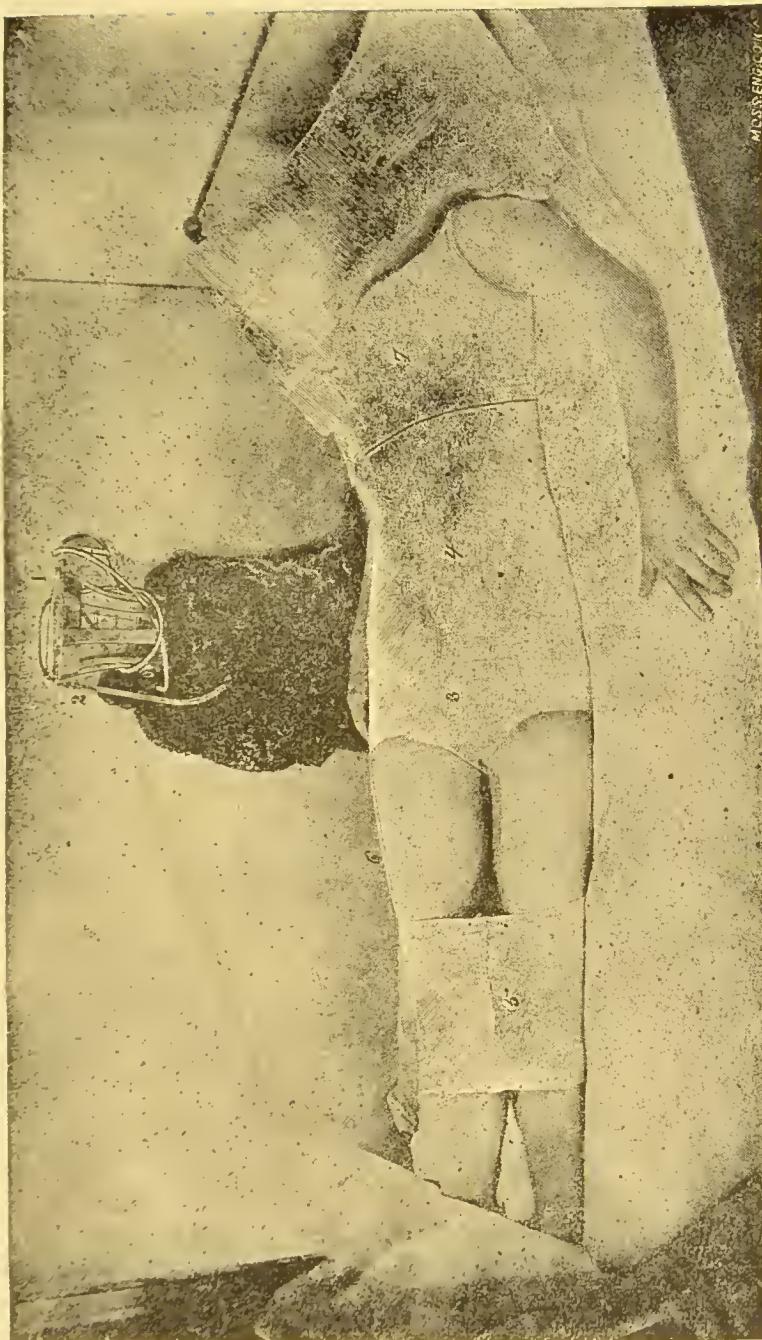
This dressing was put on with the same care as we dress a wound after an important operation, and renewed every six hours. At the same time, the outside of the genitals and the adjoining parts were cleansed by letting a stream of lukewarm solution (1:2000) run over them from the above-mentioned glass-jar through a simple glass-tube. Before each change of dressing, the nurses disinfected their hands as before labor, and any substance brought into contact with the patient, such as cotton or lint, was wrung out in the solution.

In the convalescent ward the dressing was continued as long as the patients were kept in bed. As soon as their condition warranted it, commonly between the tenth and fifteenth day after confinement, they were discharged.

No vaginal injections were given, except in the rare cases in which the lochia became offensive.

This treatment has now been in use for nearly three years, and the results have been most remarkable and noteworthy.

I stated above that when I began, the mortality had been nearly eight per cent. during the last year, and nearly twenty per cent. during the last month, and that one out of four puerperæ were severely sick. During the first three months following the introduc-



1. Douche can. 2. Intrauterine tube. 3. Occlusion dressing. 4. Belly binder.
5. Knee binder. 6. Suspenders. 7. Breast binder.
8. A label near the bottom center of the gown.

tion of the new treatment we had 102 deliveries without a single death. During the whole year from October 1, 1883, till October 1, 1884, we had 505 deliveries and seven deaths, that is a total mortality from all causes of 1.39 per cent.

Since it always will be a matter of dispute which deaths are referable to infection, I give the following details:

1. Margaret Raycroft, æt. 25, primipara, delivered January 25, 1884, died January 27th. Duration of labor 38 hours. Generally contracted pelvis, male type. Podalic version. Perforation of after-coming head. The autopsy showed healthy wounds in genitals and no signs of septicæmia. Cause of death: Shock.

2. Rebecca Gibson, æt. 38, primipara, delivered February 9, 1884, died February 16th. Great despondency and fear of death before delivery. Duration of labor 40 hours. Inertia uteri. Barnes' dilators. Forceps applied at brim. Clinical diagnosis acute yellow atrophy of liver. Autopsy not obtainable.

3. Mathilda Carlsen, æt. 36, multipara, delivered March 31, 1884, died April 9th. Autopsy: Peritonitis, perimetritis, ovaritis, cloudy swelling of liver and kidneys.

4. Jennie Ryan, æt. 21, multipara, delivered June 7, 1884, died June 16th. Cause of death pyæmia. No autopsy.

5. Mary Hogan, æt. 30, primipara, delivered

July 24, 1884, died same day. Chronic nephritis. Eclampsia. Barnes' dilators. Forceps. Uræmic coma. Autopsy: Fatty and granular kidneys, cirrhotic liver.

6. Lizzie Clare, æt. 20, primipara, delivered August 10, 1884, died August 12th Gastro-enteritis before labor, inducing premature labor at eighth month. Collapse. Autopsy: Hyperæmia of mucous membrane of intestine.

7. Mary Kelly, æt 29, multipara, delivered August 22, 1884, died August 23d. Duration of labor 26 hours. Justo-minor pelvis. Cephalotripsy, turning. Suppression of urine. Shock. No autopsy.

Of these seven deaths, I think we can fairly exclude three (Nos. 1, 5, and 6) as non-septic, which would leave 505 patients with 4 deaths from puerperal infection, or 0.79 per cent.

During the second year of the new era, the results were still better. From October 1st, 1884 till October 1st, 1885, 541 women were delivered, with a total mortality from all causes of 4; that is, 0.75 per cent. As for the preceding year, we will allow the reader to judge for himself which of these cases were septic:

1. L. Gardner, æt. 23, multipara, delivered December 8th, died December 11th. Hydramnion. Inertia. Duration of labor, 32 hours. High forceps operation. Autopsy: Piece of placenta found in uterus, peritonitis, septicæmia.

2. Minnie Lorenz, æt. 24, multipara. Delivered January 8th, 1885, died January 14th. Six months' foetus. Pneumonia and typhoid fever. Was admitted January 5th, with pneumonia. Autopsy: Typhoid ulcerations of ileum.

3. Mary Weiss, æt. 33, primipara, delivered April 18th, 1885, died April 20th. Urine before delivery contained about 40 per cent. of albumine, hyaline and granular casts. No eclampsia, but stupor. Spontaneous labor began two days before delivery. Autopsy: Chronic nephritis. About seven months' child.

4. Mary Armstrong, æt. 16, primipara, delivered July 6th, 1885, died July 10th. Low forceps operation. Pneumonia at time of delivery. Autopsy: Usual signs of pleuro-pneumonia.

These clinical and post-mortem features show that the three last cases had nothing to do with puerperal septicæmia, so that *in 541 deliveries only one death was due to puerperal infection, or 0.18 per cent.*

During the last ten months, October 1st, 1885, till August 1st, 1886, there were delivered 384 women, three of whom died, making a total mortality of 0.78 per cent.

1. Mary Laub, æt. 23, primipara, delivered January 6th, 1886, died January 8th. Generally contracted pelvis, in labor 57 hours, delivered by high forceps operation, performed by the house surgeon. By a deplorable mistake I was not notified of the pro-

gress of the case before delivery. Perineum torn an inch into the rectum, puerperal diphtheria. Autopsy: Besides changes belonging to puerperal septicæmia, cystic liver, gall-bladder containing thirty stones, chronic nephritis.

2. Jane Rogers, æt. 30, primipara, delivered and died February 17th, 1886. Eclampsia. Forceps. Seven months' child. Autopsy: No disease of genitals; severe croupous nephritis.

3. Sarah Wilstein, æt. 33, primapara, died May 20th. Premature twin labor at six months of gestation. Autopsy: Cystic degeneration of kidney, new growth in liver.

Thus, during these ten months the mortality from puerperal infection was 1 in 384, or 0.26 per cent.

The difference between the results before and after the new treatment is so astounding, and the transition from a very bad to an excellent condition so sudden, that it must convince everybody of the value of the adopted measures.

But it was not only the last year before the adoption of the new treatment which had presented the high mortality. As far as we can go back in the history of the hospital, we find a comparatively high mortality, and while the records since January, 1882, are entirely reliable, the mortality during some of the preceding years may have been higher than stated, death having taken place in Charity Hospital, and registered under other headings than child-bed.

YEAR.	DELIVERIES.	DEATHS.	PER CENT.
1875.	570	15	2.63
1876.	536	20	3.73
1877.	480	32	6.67
1878.	255	7	2.75
1879.	254	11	4.33
1880.	149	8	5.37
1881	382	9	2.36
1882.	431	14	3.25
1883.	447	30	6.71*
Total.....	3504	146	4.17

During those nine years, then, the mortality was four and one-sixth per cent., while in the two years and ten months elapsed since the new prophylactic treatment was begun, 1430 women were delivered, 14 of

* The above figures are taken from Dr. W. R. Gillette's Report for 1875, published in the American Journal of Obstetrics, 1876; Dr. Kitchen's and Dr. Estabrook's Official Reports to the Commissioners of Public Charities and Correction, 1876-80; and the written Records of Charity and Maternity Hospitals, 1881-86.

whom died—a total mortality of 0.98 per cent. In 6 cases only, that is, 0.42 per cent., was death due to infection.

If from the mortality we pass to the morbidity, the change is no less remarkable. As stated above, during the last six months I was on duty, before the change in treatment, 192 women were delivered, 46 of whom, or 24 per cent., were seriously ill.

During my next term of six months, from October 1st, 1883, till April 1st, 1884, we had not half so many cases of disease, and even when there was some little complication, the mild course of the pathological process formed a striking contrast to the previous condition obtaining in the hospital.

We made even the interesting observation that in six cases of parametritis (cellulitis), characterized by the usual symptoms and signs, such as pain, tenderness, and swelling, the temperature never rose above the normal standard, a phenomenon for which I can only account by attributing it to the efficacy of the antiseptic dressing, which kept all infection away from the parts that had become inflamed, in consequence of bruising and tears inflicted by the passage of the foetus through the genital canal.

For four months, we had not a single case of diphtheritic inflammation, that disease which had caused so much trouble, anxiety and suffering and cost so many lives up to the very date of the introduction of the new treatment. In the whole period of six months, with 218 deliveries, we had only a single case

of the kind, and that could be easily accounted for as due to direct infection, by means of an assistant's finger, from another patient delivered at the same time, whose putrid, adherent placenta had to be removed by introducing the hand up to the fundus of the womb.

I dwell with complacency on that period because it was the beginning of a new era, when everybody connected with the service, seeing the magical effect of the change in the condition of the patients, was full of enthusiasm, and kept the rules with the strictest punctuality.

In the course of time, one set of doctors and nurses has followed after the other, and thus the excellent head-nurse, Miss Murphy, and myself are the only ones who witnessed the sudden transition from a time when the air in the wards was loaded with offensive odors, when the beds were occupied by anxious, feverish, and prostrated patients, when assistant doctors and nurses were succumbing with fatigue, and the visiting physicians, who had all the responsibility, almost despaired of the possibility of obtaining better results—the sudden transition, I say, from this condition to one when the air became as sweet as in the best ventilated room in a private building, when the patients with very few exceptions were in perfect health, when the nurses had little else to do than to change the dressings at proper intervals, and the doctors were delighted with their achievements.

This period of six months with more than two hundred confinements was long enough to show the immense value of the treatment pursued. It has, indeed, convinced me that if it were always strictly carried out there would never be a case of puerperal infection, but this is next to impossible in an institution intimately connected with a large general hospital, and with a continually changing set of doctors and nurses.

It is in human nature that those who have never seen the hospital in its old shape, are not so convinced of the necessity of observing every rule in regard to antisepsis as were those who were on the service, at the time the change was made. In the course of time some little relaxation from the original zeal is apt to occur. But similar conditions would obtain in other places where they would adopt our methods. If our service is not so entirely free from septic cases now as during the first four months after the introduction of the new treatment, still the results as to saving of life are so excellent as to compare favorably with the best institutions in Europe, and to invite other lying-in hospitals who are less fortunate to give our system a trial.

In our wards, the whole treatment as described above has been followed, without any material change, since its introduction on October 1, 1883.*

* During my last service I substituted cotton batting for oakum as a cleaner material.

For a long time I was prevented from going on duty, but the method proved as successful in the hands of my colleagues as in my own. The sick ward has mostly been empty, and when used it has never been occupied by more than two or three patients.

Even from other hospitals has come evidence as to the efficacy of the use of bichloride of mercury in the way devised by me. At the last meeting of the American Gynæcological Society, in September, 1885, Dr. W. T. Lusk, Professor of Obstetrics at Bellevue Hospital Medical College, and Visiting Physician to the Emergency Hospital, where over two hundred women are delivered yearly, said that immediately after my first publication on the subject, two years before, he had adopted the preventive treatment as described by me, and since then there had been the greatest possible change in his service. He had not had a single case of [puerperal?] fever; even so-called milk fever had become a thing of the past. The pad was useful, not only for preventing the entrance of germs into the genital canal, but it enabled us to keep the wards perfectly clean.

Dr. W. L. Richardson, Professor of Obstetrics at Harvard University, and Visiting Physician to the Boston Lying-in Hospital, said that in the lying-in hospital with which he was connected, nearly the whole time during the years of 1882-83 was spent in fighting puerperal septicæmia, but after adopting many of the

suggestions contained in my paper and the use of the antiseptic dressing with corrosive sublimate, the institution had been almost absolutely free from the disease.*

The treatment has likewise given perfect satisfaction in the New York Infant Asylum, with more than two hundred confinements yearly. During the last year 220 women were confined in that institution, with a total mortality of one death, due to chronic heart disease—in other words *none due to infection*.

Perhaps the treatment has been adopted in other places without my knowledge, but here we have at least four hospitals in which it has been in use now for two years or more, and proved a great blessing to patients and physicians. What at first was an experiment suggested by a desperate condition of the Maternity Hospital, has now become a well-established method, which has proved efficacious far beyond the walls of the institution where it originated, and in entirely different hands. *In regard to hospitals, I can therefore give no better advice than to adopt the same measures which have benefited us so much*, and apart from general hygienic precautions, these are chiefly the use of bi-chloride of mercury for disinfecting the patient and everything that comes in contact with her; the careful application of the above described antiseptic dressing to the genitals; the fumigation of

*Trans. Am. Gynecol. Soc. 1885, vol. x, p 113-114.

the wards by means of a large amount of sulphur; a rapid rotation in their use; and the separation of sick puerperæ from those who are well.

The excellent results obtained in Maternity Hospital are so much more remarkable when it is borne in mind that so many of the inmates of such an institution are primiparæ, who always are more liable to disease and death. Thus, during the year 1885, of 537 confined 229 were primiparæ, that is 42.64 per cent.

CHAPTER III.

ANTISEPTIC PROPHYLAXIS IN PRIVATE PRACTICE.

There used to be so great a difference in the mortality in lying-in institutions and in private practice, that not many years ago the very existence of these hospitals was seriously threatened. In 1875 the International Congress of Physicians at Brussels, adopted among others the following resolutions:

1. Large lying-in hospitals ought to be abolished.
2. Confinements at the homes of the patients ought to be encouraged as much as possible, by assistance being supplied to pregnant and lying-in women at their homes.
3. By having the women confined at the houses of midwives, the mortality is diminished.

Since the adoption of thorough antiseptic precautions in good lying-in asylums the proportion between the mortality in them and in city practice has changed. Now the lying-in hospitals have become the safe places to be confined in, and it is in private practice that the patient has to be very careful if she will not be exposed to disease and death. With our marvelous mortality of a fraction of one per cent., we have, in our poor wards of Maternity Hospital, with our large number of primiparæ, with our many women suffering from liver or kidney disease in consequence of alco-

holism, with all the predisposing influences of poverty, debauchery and shame, reached, or even outdone the results formerly obtained by some of the most prominent obstetricians of Great Britain and Ireland, in patients belonging to the middle and upper ranks of society.*

Here in New York, the mortality outside of the lying-in hospitals, is considerably greater than in the Maternity Hospital and the other institutions of the same kind which have followed its example in adopting thorough antiseptic precautions. It is by no means only among the poor and in the practice of ignorant midwives that the mortality is great. Only too often do we see the newly confined young lady in her luxurious dwelling, situated in the finest part of the city, in the skillful hands of the most renowned accoucheurs, and attended by the most experienced nurses, stricken down by the inexorable puerperal septicæmia.

Some physicians have adopted more or less of the antiseptic precautions which have proved so beneficial in the lying-in asylums, but I do not think I err when I believe that by far the greater number of general practitioners yet conduct their deliveries in the same way that they learned at college many years ago, and which they have been accustomed to follow since they

* See Garrigues: On Lying-in Institutions, especially those in New York, in Trans. Am. Gyn. Soc., 1878, Vol. II, p. 599.

began practicing. Some tell us, when the question is discussed in our public societies, that they have delivered so and so many thousand women, and never lost one of puerperal fever, and they have never used other precautions than common cleanliness. Either their memory fails them, or they have a convenient definition of puerperal fever, in consequence of which puerperæ die of peritonitis, metritis, pneumonia, pleurisy, heart disease, liver complaint, kidney trouble, meningitis, typhoid fever, etc., etc., but never of a disease, the mere mention of which, septicæmia, would teach the propriety of adopting the antiseptic treatment.

Others say that they get so small a fee for their confinement cases, that they cannot be expected to give so much attention to their patients as is required for good antisepsis.

Others again say their patients do not want to be bothered with all these precautions, and are not prepared to pay for the materials needed for carrying them out.

Country practitioners boast of the robust constitutions of their patients and the healthy country air, which are supposed to make all antiseptic treatment superfluous.

To the first of these classes I would say that if they keep notes of their cases, and will study them in the light of our modern experience, they will find that after all they have not lost so very few patients in

childbed, probably not less than one in a hundred, and that all those diseases of which they died, are precisely the same of which our patients used to die in lying-in asylums. But since we use a thorough antiseptic treatment, they have given up that bad habit of being subject to, and succumbing to all sorts of diseases while they are lying in bed, after having given birth to a child. Now they rarely get sick, and if they do, they still more rarely die.

To the second class I would say that, apart from all moral considerations, they are mistaken as to their personal interest. If they do not use antiseptic precautions, they are sure to get septic cases. Without antiseptic treatment, most of these will end fatally, which will hurt the interests of the physician. He runs the risk not only of losing that family in which the accident occurs, but of getting into bad repute in the neighborhood. But even if he should be fortunate enough to save his patient's life, it will only be after many visits, for which he is not likely to get any payment. Finally, even with their old-fashioned limited views with regard to the origin of puerperal fever, these practitioners know this much, that that disease is eminently contagious, and consequently they risk carrying the infection from one puerpera to another, and getting into new trouble in other families. No, the most selfish physician cannot do better than to adopt the antiseptic treatment, both prophylactic and curative.

The third class has my full sympathy, so much more so as I have met with such obstacles in my own practice. But I think that in a great majority of cases the difficulty can be overcome by a little quiet reasoning. Everybody has heard of puerperal fever, and most women and their friends are full of apprehension at their approaching confinement. When now we can assure them in good conscience that, if they consent to have certain things done, which in themselves are very simple, they never will have an hour's fever, that makes such an impression on their minds that most patients are willing to leave all in the hands of the physician who speaks with so much assurance. If they are poor the system can be brought down to such a degree of simplification, that what is needed during the whole confinement, does not cost so much as a single extra visit by the physician.

Finally, I would like to impress the importance of antiseptic midwifery on country practitioners, the most numerous class of physicians. The moment it is known that puerperal septicæmia is due to infection, all arguments based on the good constitution of the patient, and the invigorating influence of country air on the body, lose their value. All that these favorable conditions can do for the lying-in woman, is to help her to throw off the poison that has infected her system, but often even in that respect the good constitution and the wholesome air will be found insufficient, and it is obvious that they cannot prevent the woman from

being infected. In some respects, the circumstances are even less favorable for those delivered in the country. Absence of sewers necessitate the accumulation of feces and urine in privies, at a short distance from the house. The fields in the immediate neighborhood are often spread with these substances as manure. All sorts of refuse are thrown on the dung-hill, where it undergoes putrefaction. Often a country butcher's place sends the malodorous effluvia from drying skins and decaying offal to considerable distances.

Still greater is the danger from the physician himself. He cannot go home and change his dress and take a disinfectant bath. When once out on his long journey, he must see the patients in the order of their residences, and thus he may be compelled to go directly from a case of erysipelas or diphtheria to a confinement. The fingers that a short while ago were immersed in the pus mingled with the shreds of dead tissue of a diffuse phlegmon, may in the next house have to peel off an adherent placenta. Nay, once in a while, the country practitioner may even hold an autopsy and thereafter go to a confinement, where he must introduce hand and forearm into the uterus, in order to perform version.

As a matter of fact, puerperal septicæmia and death from puerperal infection are found everywhere. I know personally of a case which occurred last summer in the healthiest part of the Catskill mountains.

Sometimes the mortality from puerperal septicæmia may even be very high in country places, and not only from so-called epidemics, where the poison is carried from patient to patient by midwives or doctors, but from sporadic cases extending over a long period. Hegar* has furnished a striking example of this. Sprachbrucken, a village near Darmstadt, Germany, offered in five years the following puerperal statistics, viz: in 1860 18 women were confined, with 1 death; in 1861 26 women, with 4 deaths; in 1862 29 women, with 4 deaths; in 1863 24 women with 3 deaths; in 1864 25 women, with 1 death, which makes a total of 122 women confined, with 13 deaths, *or a mortality of 10.6 per cent.*, which is considerably higher than in the Maternity Hospital in the worst days of that institution.

The country practitioner ought therefore, no less than his city *confrère*, to give his parturient and lying-in patients all the benefits of antiseptic midwifery.

My friend, Dr. Henry A. Leipziger, who started the strict antiseptic treatment with me in the Maternity Hospital as my house surgeon, and who now practices in Burlington, Iowa, writes me: "I do not find any obstacles offered by poverty, but principally by ignorance, which seems to object to this method. Women

*Hegar: Die Sterblichkeit während Schwangerschaft, Geburt und Wochenbett. Freiburg im Breisgau, 1868, p. 42.

of refinement have said that the changing of the pad seems to refresh them, and make them feel much more comfortable than the cloths they had formerly used."

Several physicians who have a large obstetric practice here in New York City, and among others have many confinements in tenement houses, have told me that they adopted my treatment with the bi-chloride and the occlusion dressing when I first published it, and that while they formerly had a case of puerperal fever every month, since then they have been entirely free from the disease. They say the patients invariably like the dressing, and do not object to the small extra expense. Some of these physicians go so far as to make the consent of the patient to this treatment a condition of their services. If the patient refuses to buy the necessary materials, they decline to take the case.

Some private practitioners may have been a little scared by some of the prophylactic measures which Dr. T. G. Thomas, in his elegant paper on the Prevention and Treatment of Puerperal Fever,* that doubtless has contributed much to awaken a more general interest in the question of antiseptic midwifery in this country, declares should be adopted in all midwifery cases, whether they occur in hospital or private

*T. G. Thomas, in the New York Medical Journal, December 15, 1883.

practice. Few physicians are fortunate enough to have so wealthy a practice, or enjoy such an authority over their patients that they can adopt all the rules laid down by the distinguished teacher, and I think an efficient antiseptic treatment may be used under different circumstances, and by every physician.

In wealthy private practice I use essentially the same treatment as in the hospital, with slight modifications in the materials. First of all I disinfect my own hands and have the nurse do the same. Next I direct the nurse to give the enema and let her, under my supervision wash all the parts liable to be touched during delivery with the solution of bichloride of mercury. The vaginal injection I prefer to give myself. During labor and delivery, I constantly have a basin or bowl with clean solution (1:2,000) standing at the bedside, and never touch the patient without holding my hand immediately before, for at least a minute, in the fluid, in which likewise every other object that comes in contact with her genital canal, is immersed or wrung out. In protracted cases, the vaginal douches are repeated every three hours or oftener. After delivery the patient is again washed with the solution, and the occlusion dressing put on in the following way. I take a piece of unbleached muslin forty-two inches long and fold it lengthwise, so as to make it half a yard wide. This is used for a binder descending down below the trochanter major. It is pinned moderately tight from below upwards by means

of safety-pins leaving a shallow V shaped opening free at the lower end, where otherwise it would cover the genitals. At the upper end, more or less of it is folded transversely according to the stature of the patient, so as to end a little below the ensiform process. The well closed vulva is covered with a pad of absorbent cotton of the proportions indicated above for the lint, and wrung out in the solution (1:2,000). Outside of that comes a piece of oiled silk or preferably thick gutta percha tissue dipped in the solution. The cotton pad should reach from one genito-femoral furrow to the other, and cover the symphysis in front and the anus behind. The water-proof tissue must go one fingerbreadth beyond the pad in all directions, and is folded forward against the inside of the thighs. To keep this antiseptic part of the dressing in place, I use a large pad of dry absorbent cotton, and a rectangular piece of canton flannel or a square piece of unbleached muslin, half a yard in both directions, and folded diagonally like a cravat. The ends are likewise folded in, so as to obtain a rectangular bandage five inches wide and about fourteen inches long, which is pinned with four pins in front and two behind to the binder, so as to fit the parts tightly. This dressing is removed in the morning, the afternoon, and the evening. The patient passes her urine spontaneously, or, if she is unable to do it herself, it is drawn with the catheter. A stream of lukewarm solution is directed by means of a syringe, over the outside of the

genitals and the adjacent parts, and a fresh dressing is applied.

It will be seen on the plate that the different binders are put on with a large number of pins, placed with great regularity. This can be done in Maternity Hospital, because we have a large number of nurses, for whom it is a good exercise, and all to the profit of the patients; therefore, it ought to be imitated in private practice, if the patient has a trained nurse, and in hospitals, if they have nurses enough. Otherwise, a much smaller number of large safety pins placed lengthwise will save much time and trouble, and give nearly as good results.

During labor and delivery there ought always to be plenty of solution on hand. I am in the habit of carrying in my satchel powders of corrosive sublimate, containing each fifteen grains, so as to be sure under all circumstances to be able to prepare the solution. Otherwise, I prescribe half an ounce divided into sixteen powders, each containing fifteen grains. One of these powders dissolved in a quart of water makes a solution of 1 in 1,000. For most purposes this solution is mixed with equal parts of water, so as to contain one part of bichloride in 2,000 parts of water, but for intra-uterine injections it is mixed with three parts of water, so as to contain 1 in 4,000. By varying the temperature of the water added, any desirable temperature is given to the diluted solution. For external use and most injections, vaginal and intrauterine, it is

used pleasantly lukewarm, but when the object is to make the uterus contract, it should be given so hot that the accoucheur can just hold his hand in it, that is 110° to 115° F.

The vessels I use are two glass bottles containing one quart each, two pitchers, and two basins or bowls of china or earthenware. The doctor should not grudge the trouble of cleaning all these utensils himself before use. The two bottles are used for the strong solution, the pitchers for the hot and cold water, and the basins for the diluted solution. A powder is thrown into the empty bottle, and a small quantity of hot water is added. By shaking well the bottle is made evenly warm, and protected from cracking. Gradually more hot water is added, the bichloride being much more dissolvable in hot than in cold water. Finally, enough cold water is added to fill the bottle. One of the basins is needed at the bedside, for the hands of the doctor; the other is used for mixing the fluid needed for injections and for the dressing.

Where economy is necessary, this treatment may be more or less modified. First of all, common cotton batting may be substituted for the more expensive absorbent cotton in the outer part of the dressing, where it only serves to give bulk, or even, though less well, in the inner antiseptic pad. Thus the expenses for the materials would be reduced to a bundle of cotton batting, 8 cents; a yard of the best gutta percha tissue, 50

cents; and say six yards of unbleached muslin, at 6 cents a yard, that is 36 cents. Let us count 50 cents for corrosive sublimate, and we have all that is needed, for \$1.44. The bed-pan, although very handy, may be replaced by any kind of low vessel, for instance, one of the common tin basins worth 10 cents.

But we may go still further in our reduction and yet let the patient have the benefit of the most essential part of the preventive antiseptic treatment. If even this small expense should be too onerous for her, the physician may give up the dressing, that, although valuable, is of less importance in private practice than in hospitals. Thus in its most reduced shape the antiseptic treatment in normal cases will consist of disinfection of the patient by means of washing and vaginal injections with bichloride of mercury *before* delivery, disinfection of the doctor's hands by means of the same, and of his instruments, if any are used, by means of a five-per-cent. solution of carbolic acid. During the lying-in period bichloride ought, likewise, to be used for the ablutions of the genitals, if for no other purpose at least in order to disinfect the water, the rags and the hands of the person who washes the patient.

In large cities, patients who are so poor that they have to economize to such an extent, had much better go to a lying-in asylum in which antiseptic treatment is fully carried out; but I can imagine that, in small towns and in the country, poverty may necessitate the

strictest economy, and I wish to extend the benefit of antiseptic midwifery to the poorest.

As to the glass-tube used for intra-uterine injections everybody can easily make a light case for it of the thin wooden splints, lined with canton-flannel, which are sometimes used for fractures. Where it cannot easily be replaced when broken, a tin tube with a large opening at the end, as found at the instrument-maker's, or even a new English catheter with a stylet, may be substituted for the more fragile glass-tube.

These flexible tubes, be they of tin or gum, have even the advantage over the glass-tube, that they can be used in cases of abortion, where the glass-tube would be too large, or its curve ill-adapted to the shape of the uterus. It is true, the tin will be corroded by the bichloride, and consequently weaken the solution, but this loss of strength of the running fluid is so small that it is of no practical importance. It is quite another thing with the vessels in which the solution stands for a longer time, such as bottles, pitchers or basins. They ought all to be of glass or earthenware, or japaned metal.

As far as possible the patient ought not to be confined in a room connecting immediately with a water-closet, or at all events the door must be kept fully closed, and some disinfectant, for instance Platt's chlorides, thrown into the hopper.

Likewise should rooms without windows be

avoided if feasible. The stagnant air in such a room is decidedly unfavorable for the parturient and the puerpera.

CHAPTER IV.

ANTISEPTIC TREATMENT OF PUERPERAL INFECTION.

If the measures recommended in the preceding chapters were strictly carried out, we would never have to treat a case of puerperal infection, but since many confinements are yet conducted without antisepsics, and since, especially in hospital practice, when many different individuals have to deal with one case, faults will be committed, we are still called upon to treat the consequences of puerperal infection. Knowing the origin of the disease we apply the same principles to its treatment as to its prevention. Most of the old-fashioned remedies, such as bleeding, salivation, purgation, blistering, collodium, etc., have been discarded, not only as useless, but because they are all more or less harmful.

As the disease is started by infection of the wounds in the genital canal, the first indication is to remove the infecting substance, and to seal as far as possible the manifold ducts leading from the denuded surfaces into the body, such as veins, lymphatics and interstices between the bundles of the connective tissue. The second indication is to help nature to eliminate the poison that already has invaded the system. To meet the first of these indications we have power-

ful remedies, to fulfill the second our resources are much more limited. It is therefore obvious that no time ought to be lost with general treatment before a thorough local treatment has removed as much as possible of the infectious matter from the genitals, and changed the condition of the wounds.

If these cases come under early observation, and are thoroughly treated on antiseptic principles, the prognosis is pretty good. During my last term of six months in Maternity hospital, from September 1, 1885, till March 1, 1886, 238 women were delivered. Of these 12 were affected with puerperal septicæmia, and only one died, and even she might perhaps have been saved under more favorable circumstances. I refer to the above mentioned case of Mary Lamb, who was delivered on January 6, 1886, by high forceps operation, performed by the house surgeon.

The occurrence of so great a number of septic cases, is in my opinion exclusively due to the fact that, without my knowledge, and against strict rules, the house surgeons had allowed members of the Charity Hospital Staff to come to the delivery room, and sometimes even deliver cases. As soon as this came to my knowledge, and I again forbade the abuse, and had my own staff thoroughly disinfected, there was not another case of infection.

The first signs of infection are, as a rule, a rise in temperature, and increased frequency of pulse and respiration. As soon as these symptoms appear, an

examination of the genitals should be made. If the temperature is moderate, say below 102° F., we may not find any visible change, and a few vaginal injections with the solution of bichloride (1:2000), given every three hours, five grains of quinine three or four times a day, and a mild aperient if the bowels have not moved, are all that is called for, and will remove the disturbance in a day or two.

In other cases, we may find pain, sensitiveness, and swelling in one of the broad ligaments (*parametritis*). A similar treatment and an ice-bag on the affected side will probably end the inflammation in a few days.

The ice not only soothes pain better than poultices, and abridges the course of the inflammation, but, according to some recent experiments of Zweifel, it seems to deserve a place among antiseptic remedies, since certain microbes only grow at the normal temperature of the body.*

It is already more serious if we find the womb larger than it ought to be, in view of the time elapsed since the patient was delivered, if it is tender, and the lochial discharge dirty and offensive (*metritis*).

If there is any doubt whether all of the afterbirth was removed immediately after delivery, the patient ought to be anæsthetized, the whole hand perfectly disinfected, introduced up to the fundus, the finger-

* Zweifel, in *Archiv. für Gynäk.*, 1885, vol. xxvii, p. 315.

tips carefully moved all over the inner surface, and whatever may be found, scraped off with the nails, and the uterus washed out with bichloride (1:4000).

After having done that, it is good to introduce through a Cusco's speculum, by means of a long dressing forceps* bent like the intra-uterine glass-tube, a suppository containing one hundred grains of iodoform, clear up to the fundus, and leave it there:

B Iodoformi, 3 v.
Amyli, 3 ss.
Glycerinæ, fl. 3 ss.
Acaciæ, 3 i.

Divide in three suppositories of the size and shape of the little finger (modified from Ehrendorfer).†

In many of these cases the intra-uterine injections need not be repeated. Vaginal injections (1:2000) every three hours, combined with half a fluid drachm of the fluid extract of ergot three times a day, five grains of quinine three times a day, painting of the hypogastric region with tincture of iodine once a day, and the application of a compress dipped in carbolized glycerin and water, and covered with oiled silk, oiled

* I have had a very convenient one made by Caswell, Hazard & Co., who sell it for \$2.25. A straight or only slightly curved forceps often does not answer the purpose, and exposes the patient to the danger of wounding the uterus.

† Archiv für Gynäkologie, 1884, Vol. xxii, p. 84.

muslin, guttapercha tissue, or some other water-proof substance, that is all that is needed:

R Acidic carbolici, fl. 3 j.
Glycerinæ, 3 j.
Aquæ, ää fl. 3 iiij.
M. S. For external use.

If the womb is tender on pressure, or there is spontaneous pain, an ice-bag ought to be applied for some days before the iodine is used.

In most cases we will find the wounds in the vulva, vagina, and cervix to be the seat of diphtheritic infiltration, exactly as in diphtheritic sore throat or in an operative wound which has become diphtheritic (*puerperal diphtheria*). It lies without the scope of this little book to give a description of all puerperal diseases. All I can do here, is just briefly to allude to the most common occurrences in child-bed that call for antiseptic treatment. As to the most common of the graver forms of puerperal infection, I may refer the reader to my recent paper on Puerperal Diphtheria,* read before the American Gynæcological Society.

Puerperal diphtheria calls for a very energetic

* Garrigues: Puerperal Diphtheria, Trans. Am. Gyn. Soc., 1885, Vol. x., pp. 96-111. Abstracts in Am. Jour. Obstet., October, 1885, Vol. xviii., p. 1054. New York Med. Jour., September 26, 1885, Vol. xlii., No. 13, p. 354, and other periodicals from that time.

antiseptic treatment, and if this is attended to early, the prognosis, as stated above, is pretty good. I have in vain tried tincture of iodine, iodoform, and undiluted carbolic acid. Dr. Lusk treated his cases with the application of sub-sulphate of iron and compound tincture of iodine. Of the first set of twelve two died, but out of the next twelve only two recovered.* The only local application that has given me satisfaction is the chloride of zinc.

The patient being anæsthetized is placed on a table in front of a window, in lithotomy position. A bed-pan is placed under her. A copious, pleasantly warm vaginal douche of bichloride (1:4000) at least one quart, is given. Cusco's speculum or another suitable bi- or tri-valve speculum is introduced and made to embrace the cervix. The height of the fundus uteri is taken, and its distance from the entrance of the speculum marked on the intra-uterine tube by means of a thread, so as to be sure to introduce the tube up to the fundus, where its tip may likewise be felt. The fluid is made to run so as to fill the tube before it is introduced, and then the clamp on the rubber tubing, which ought to be pushed near up to the glass-tube, is closed, so as not to have the water running while the tube is being introduced into the os, which obstructs the view. As soon as the tube has entered the cervical canal, the fluid is again turned on, while the tube is

* *Gynæcol. Transact.*, 1885, Vol. x, p. 112.

pushed carefully and gently up to the fundus. The fluid ought to be kept running until it returns quite clear, for which purpose two or three pints are required. Larger quantities or a stronger solution are not safe on account of the rapid absorption taking place from the denuded inside of the uterus.

Next, the tube is withdrawn, and the uterus gently squeezed, in order not to leave any large amount of fluid in its cavity. The whole inside of the cervix up to the internal os, and diphtheritic patches on the vaginal portion are thoroughly cauterized with a solution of chloride of zinc in equal parts of distilled water, by means of swabs made by winding absorbent cotton around the end of wooden sticks of about the size of lead pencils. The caustic ought to be kept in contact with the affected tissue for a minute. The tube is reintroduced as far as the internal os, and the superfluous chloride of zinc washed off.

Thereafter the above described pencil with 100 grains of iodoform is brought up with the curved forceps to the fundus, which is very easily done with this forceps, through the speculum. In order to be sure to place the pencil within the body of the uterus, the distance between the fundus, which as a rule has come lower down in consequence of the intra-uterine injection, and the entrance of the speculum, should be measured with the forceps before introducing it.

Next, all diphtheritic patches in the vagina and the vulva, and all large wounded surfaces, for instance

the whole of a torn perineum, are cauterized with chloride of zinc as described above for the cervix.

Finally, the vagina is again washed out with the bichloride of mercury solution, the antiseptic dressing put on, and the patient replaced in bed.

In most cases this treatment will be followed by a fall of two or three degrees in temperature, and a repetition is only called for once in twenty-four hours, but sometimes the temperature rises again to 103° or more, say twelve hours later, when the whole procedure is to be repeated. The genitals must be exposed to a strong light. If the diphtheritic inflammation has spread, the new patches are cauterized, whereas the old ones, if thoroughly treated the first time with chloride of zinc, need never be touched again.

The first effect of the chloride of zinc is to mark the diphtheritic infiltration much more distinctly. Later a slough is formed which comes off in small shreds during the course of a week.

The object of this cauterization is a double one. It destroys the microbes on and near the surface, and it effectually seals all the canals leading from the surface to the deeper tissues, and thereby prevents new invasions from without.

Sometimes torn or abraded surfaces in the genital canal are covered with a thin yellow film, which must not be confounded with diphtheritic infiltration. It consists only of a little inspissated pus, and is entirely innocuous. It differs from the diphtheritic infiltration

by being strictly limited to the wounded surface, where it forms a thin continuous layer that can be wiped off, whereas the diphtheritic infiltration begins in discrete spots, is more frequently pearl-gray than sulphur-colored or milk-white, forms thick membranes, spreads into the surrounding tissue, may appear on apparently intact mucous membranes, and is so closely connected with the tissue that it cannot be separated from it. Besides these local differences, the innocuous yellow superficial deposit on wounds is not accompanied by fever or any other symptoms of disease, and the wounds heal in a few days, or in the course of a week or two, without any other treatment than the continued use of the antiseptic dressing.

The color of the slough produced by the chloride of zinc is almost exactly the same as that most commonly found in the diphtheritic patches themselves. The physician may therefore sometimes be in doubt whether the infiltration has spread any since his last application. In order to obviate this difficulty, he must notice and remember which places he cauterizes, and, secondly, there is this difference, that the diphtheritic process proceeds unevenly, forming a scolloped outline, whereas the slough of course retains its plain sharp outline.

The vagina is washed out with the solution of bichloride of mercury (1:4000) every three hours.

Besides this local treatment, a general supporting treatment is instituted, on the theory that some of

the poison has penetrated into the system, and that the indication is to sustain the strength of the patient until it can be eliminated through the kidneys, the bowels, the skin, and perhaps the mucous membrane of the lungs.

I give fluid extract of ergot, 3 ss to 3 i, three times a day in order to promote uterine involution, which, in most of these cases, is deficient, five grains of quinine every six hours, at least half an ounce of whiskey or brandy every two hours or oftener, and digitalis when the action of the heart is weak. We have found an infusion of half a drachm of fresh leaves to six ounces of water to be the best preparation. Of this we give a tablespoonful every four hours. If a prompt effect is called for, we inject, hypodermically, five minims of the tincture, repeating it according to circumstances.

If the treatment is begun in time, refrigerants and antipyretics rarely become necessary. The amount of quinine and digitalis given is too small to bring down the temperature. To give large doses of quinine, or use antipyrine or salicylate of soda from the beginning seems to me more to mask than to cure the disease.

If, however, in spite of the intra-uterine treatment, the temperature remains high we combat it with sponge-baths of plain cold water, or water and alcohol, ice-bags, or a rubber coil with running ice-water

applied to the head or the abdomen,* salicylate of soda in fifteen-grain doses repeated every hour, antipyrine, in the same dose, or carbolic acid, one minim every hour.

Carbolic acid has likewise an excellent effect on the diarrhœa that is so common a feature of puerperal septicæmia, either alone or combined with compound tincture of iodine:

R. Acidi carbolici purissimi.
Tinct. iodinii co, ää ℥xvi.
Mucilaginis acaciæ, fl. ʒ ij.
Aquæ destillatæ, ad fl. ʒ viij.
M. S. A tablespoonful every hour.

The cold pack and the cold bath are powerful antipyretic remedies, but less practicable on account of the weak condition of the patient and the difficulty of their administration.

If there is any pain, one-eighth to one-sixth of a grain of morphine is given and repeated as the case may indicate. I administer it as a rule through the mouth, which is pleasanter for the patient, and does not require so frequent attendance of the physician.

If there is a local inflammation of the uterus or its surroundings, and the vitality is low, in order to soothe pain and further absorption of the exudate, I prefer a warm linseed-meal poultice to the ice-bag.

If the diphtheritic inflammation has only attacked

* A convenient apparatus for that purpose has been patented by Wilhoft.

the vulva or the vagina, and the vaginal portion and the lochial discharge appear healthy, the chloride of zinc is not used on the uterus, and the injections are limited to the vagina.

On the other hand, if the uterus is affected, I give at least once in twenty-four hours an intra-uterine injection, until the sloughs come off, and the temperature is normal, which occurs in the course of one or two weeks.

The only exception from this rule are those very rare cases in which the temperature, far from diminishing, actually increases every time the injection is given. Here I desist from them, and rely on vaginal injections and the general treatment described.

When all sloughs have come off, and suppurating surfaces are left, intra-uterine injections are discontinued, and vaginal injections given three times a day.

When the temperature has become normal I substitute chloride of iron for quinine:

R. Tincturæ ferri chloridi, fl. 3 ss.

Syrupi simplicis, fl. 3 j.

Aquæ destillatæ, ad fl. 3 viij.

M. S. A tablespoonful four times a day.

If the iron brings on bloody lochia, I substitute a medicine with sulphuric acid and bark as a tonic:

R. Acidi sulphurici aromatici, fl. 3 ii.

Extracti cinchonæ fluidi, fl. 3 i.

Aquæ fontanæ, ad fl. 3 viii.

M. S. A tablespoonful four times a day.

In cases of *septicæmia* without diphtheria, a treat-

ment similar to the one just described is followed, leaving out the cauterization with chloride of zinc.

The diet must in the beginning consist only of fluids, chiefly milk and strong beef-tea, but as soon as the condition of the stomach allows it, soft-boiled eggs and raw oysters may be added, soon to be followed by roast meat and other substantial food.

In *peritonitis* my treatment consists in antiseptic injections, ice-bags, brandy and opiates, especially morphine. At the beginning of the disease, the uterus is thoroughly washed out with the solution of bichloride of mercury (1:4000) in order to remove whatever septic material may yet be found in its cavity, and a pencil with 100 grains of iodoform is left in, but physical rest being a chief feature in the treatment of this disease, the intra-uterine injections are not repeated. If there is any foetid discharge from the vagina, it is washed out with bichloride of mercury (1:2000, or if there are large wounds 1:4000) every three hours, otherwise the genitals are only covered with the antiseptic dressing.

Two large flat rubber bags well provided with ice lumps are kept on the abdomen and, on account of the stupifying effect of the morphine, are well borne in spite of their weight. In order to bring the patient rapidly under the influence of the morphine, it is advisable to start with a dose of a quarter of a grain administered hypodermically, after which the effect is continued by means of one-eighth to one-fourth of a

grain given in solution by the mouth, and repeated every half hour, until the patient is free from pain, but not more deeply narcotized than that she can easily be roused from her sleep, and that the respirations do not go below fourteen in a minute. In this way I have given a patient during twenty-three days on an average nine grains of morphine daily, and in one day nearly fourteen grains. I prefer the administration by the mouth, because the drug comes in more direct contact with the diseased parts; secondly, because I have seen the opening made with a hypodermic syringe become the starting point of fatal infection; and thirdly, because the doctor cannot be present so often as would be required if he should administer all the morphine himself, and nobody else ought to make a hypodermic injection.

As to diet, the patient receives only milk and beef-tea made by boiling a pound of finely chopped lean meat with a few ounces of water and twenty drops of dilute muriatic acid in a bottle for two hours, straining and adding salt to taste.

The bowels are, as a rule, left undisturbed. From time to time there will be a spontaneous passage; otherwise an enema is given.

For further details on the subject of puerperal peritonitis I may refer the reader to a paper I wrote a year ago in the *New York Medical Journal*.*

* Garrigues: The Opium Plan in Puerperal Peritonitis, in the *New York Medical Journal*, January 24, 1885, Vol. XLI, page 98.

The inflammations of other organs such as the liver, the lungs, the pleura, the meninges, the joints, etc., may offer special indications which it would bring us too far from our subject to discuss here, but whenever there is puerperal infection, local antiseptic measures ought to form part of the treatment.

I may only add a word about *bed-sores*, since they, to some extent, call for antiseptic treatment. As preventive, a water mattress or a rubber air-cushion is very useful. Slight erythema of the skin on the sacrum is often cured by bathing with lead water. If the epidermis peels off, I dress the sore with glycerate of tannin (3*i* to $\frac{2}{3}$ *i*). In deep loss of substance, I have seen excellent effects from camphor in the following combination, viz.:

R Camphoræ, $\frac{2}{3}$ ss.
Mucilaginis acaciæ, $\frac{2}{3}$ i.
Aquæ, $\frac{2}{3}$ iv.

M. S. Shake well. For external use.

The dead tissue is removed with scissors and forceps, and the sore dressed with pledgets of absorbent cotton or lint, soaked in this emulsion. This brings on a wonderfully rapid growth of granulations, which soon fill even a large and deep hole.

CHAPTER V.

CONSIDERATIONS OF SPECIAL POINTS RELATING TO ANTISEPTIC MIDWIFERY.

Everything that prevents or destroys sepsis is antiseptic. In the preceding chapters we have especially dealt with the prevention and treatment of infection in hospitals and private practice, by means of chemical agents used in the lying-in room during and after labor. There are, however, other points to be considered, and even in regard to the special antiseptic measures already indicated, some further developments seem called for.

FRESH AIR.—Proud as we are entitled to be of our modern achievements by means of strict antisepsis, we must not overlook the experience of former times. It has at all times been found that the result in lying in hospitals became much worse when the patients were crowded together in an insufficient space. In many places, *e. g.*, Dublin, Vienna, and Copenhagen, the introduction of a good system of ventilation has considerably diminished the mortality. But that plenty of air, and the best of ventilation, are not sufficient, nay, are of quite secondary importance when compared with antisepsis, was proved in the lying-in asylum of the last named city.

In 1849 that institution was entirely reconstruct-

ed. All the wards were changed into large separate rooms, each with a window, and only one bed, without direct communication with the neighboring rooms, but all opening on a large common corridor with numerous windows. Excellent ventilation was provided by shafts running from every room up to a common main shaft, in which a large fire was kept burning, so as to produce a strong ascending current, whilst fresh air constantly entered the wards through large ventilators communicating with the outer air near the floor. The institution contained forty-four separate sick-rooms, only one-half of which were in use at a time, while the other half was being aired. In spite of this costly arrangement, the object of the admiration and envy of foreign accoucheurs, the mortality from puerperal fever during the next twenty years did not decrease below 1 in 39, and during one period of five years it was even 1 in 14.*

In Maternity Hospital, on the other hand, where the mortality from puerperal fever last year was brought down to 1 in 541, we have no ventilation at all, except by keeping the windows open day and night. In private practice we protect our patients most carefully against draughts, and here we keep the windows open at least six inches on two or three sides, day and night, winter and summer. This must interfere somewhat with the normal and beneficent perspiration of

* Stadfeldt: *Les Maternités*, Copenhague, 1876, pp. 6-10.

child-bed, one of the means by which the body of the puerperal woman unloads the waste material engendered by the retrogressive metamorphoses going on in it. Still, we have never seen any harm arise from this source, and I think the fresh air continually circulating through our wards is an item, without which we could not obtain such good results as we do.

Fresh air is admitted on a still larger scale, after a ward has been emptied and fumigated. Then we leave all doors and windows open to their full extent, for at least one day, and for three or four if the number of new cases is not so great as to necessitate an earlier occupation of the ward.

WATER-CLOSETS. — Old-fashioned privies with their putrifying animal products, contain a danger for parturient and lying-in women, against which we must protect them. In lying-in hospitals there will, of course, be water-closets with running water, but it is not enough to partition them off from the ward by a few boards. They must be entirely removed from the wards and placed either in a separate building, or at the other side of a corridor or of an intervening room in which the windows are kept open. In the water-closets themselves there should likewise be an open window. The hopper must be kept clean, and for the disinfection of the pipes it is good daily to throw some cheap disinfectant into them, such as chloride of lime, sulphate of copper, sulphate of zinc, etc.

Bed-pans ought to be removed as soon as used, emptied into the water-closet, cleaned and disinfected. In private practice I have found Platt's chlorides diluted with eight parts of water a convenient and cheap disinfectant for this purpose.

To sprinkle a weak solution of carbolic acid on the floor, such as druggists are in the habit of keeping and recommending to their customers, is worse than useless. It cannot possibly disinfect anything, and its strong odor may prevent the discovery of foul emanations.

Laundry.—It is of great importance in lying-in hospitals to pay attention to the laundry. It is not enough that sheets, blankets, ticks, pillow-cases, shirts, etc., be washed after each confinement, with sufficient care to remove all dirt and spots from them. If a patient has been so sick as to make it likely or sure that she has been suffering from puerperal infection, all clothes that she has used on her person or in her bed must be disinfected and washed separately from the linen used by the well women. In Maternity Hospital I have had large casks holding all the bed-clothes from one patient placed in the small rooms between the wards and the water-closets. Here the clothes are immersed for an hour in undiluted solution (1:1000) of bichloride of mercury, and then washed before they go to the laundry, where they are mixed with other clothes.

ROTATION OF WARDS.—A regular and rapid

rotation in the use of the wards is of great importance in a lying-in hospital. Even before our new era in Maternity Hospital, when we used the wards in a haphazard way, we noticed that, as often as a ward was emptied, fumigated and cleaned, the patients were free from fever for a week. When I made the other changes in the service I had this point also regulated as described above. Each ward of six or nine beds is only used for one set of patients, each of whom stays till the ninth day, when she is transferred to the convalescent ward, in which she stays only a few days longer, unless some abnormality in her condition calls for longer rest and treatment.

Every time the last patient in a ward has reached her ninth day, it is fumigated, aired, and disinfected.

A similar alternation is kept up between the two wards of which the lying-in service in the New York Infant Asylum is composed.

SEPARATION OF SICK AND HEALTHY PUERPERÆ.
—In every lying-in hospital, be it ever so small, a sick-room ought always to be kept in readiness for use. This is one of the chief changes I have introduced in Maternity Hospital, and later, when I was appointed obstetrician to the Infant Asylum, I insisted on the same in that institution.

In the first place, we have for that purpose, a large ward in which ten patients could easily be accommodated, but the greatest number I have had there at one time, has been three. In the Infant Asy-

lum I had a room on the top floor, large enough to contain four beds, arranged for sick puerperæ.

If there is no such place set apart, and a special room shall only be provided for "isolating" a patient when she is deemed to be dangerous to the other patients, the measure will not be resorted to often enough and early enough to yield all the advantages of which it is capable. I do not mean to say that every patient whose lying-in period shows the slightest deviation from the normal, need be removed from the other patients. I leave all patients with a slight rise in temperature, with a little foetor of the lochial discharge, with local peritonitis, or parametritis, in the wards. The only kind of patients I have so far had occasion to remove, were affected with puerperal diphtheria. These are removed as soon as the diagnosis is made. As a rule, it has been a sudden rise in temperature to 103° , 104° , or 105° , which has called attention to their dangerous condition. They were brought immediately to the sick-ward, where an inspection showed the diphtheritic infiltration, and the above described treatment was begun.

Experience has taught me how important it is both for the other patients to be spared from the dangerous neighborhood of the sick one, and for the latter to come as early as possible under treatment. At the beginning of the disease we can successfully combat it with our powerful local antiseptics, whereas, when once the system is over-filled with poison, the

remedial agents at our command are much less to be relied upon.

The sick patient must have her own day and night nurse, who have nothing else to do but to watch her, feed her, give her medicine, cheer her up, and make her feel as comfortable as the sad circumstances will allow. She is put under the special care of a member of the house staff of Charity Hospital who does not belong to Maternity Hospital, and is able and willing to devote considerable time and strength to the details of her treatment. I have found excellent assistants in these young men, and many a patient owes her life to their devotion. For obvious reasons I cannot take any very active part in their care. At the outbreak, I show the assistant the local treatment, and give him, at my daily visits, general directions for the course to be followed, but once started the local measures are left in his hands, and numerous are the incidents in the course of twenty-four hours which appeal to his own delicate tact, discrete judgment, and prompt decision.

The nurses are entitled to no less praise, perhaps even to more, for the young men are to some extent animated by scientific interest and the desire to acquire an experience that may prove useful in their future practice. The young women are called away from all other work, and that often from work which they regard as more useful to them. They have no motive except that of doing their duty to the best of their

ability, and the feeling that the final result, in which they all are interested, to a great extent depends upon their faithfulness. Only few of them understand that, in tending one severe case of puerperal fever, they learn more of nursing than in helping at a score of deliveries, and in dressing normal patients.

The temptation is great here to introduce histories, in order to show the details of the treatment and its effect, but the narrowness of the space allotted to me forces me to limit myself to the general assertion that I have seen the most desperate cases saved by intelligent treatment and careful nursing.

I need hardly add that of course the sick ward has its own set of instruments and utensils which are never used for the well patients.

REMOVAL OF THE AFTERBIRTH.—No treatise on antiseptic midwifery would be complete without calling special attention to the advantages of Credé's method of removing the afterbirth by "expression." In another place* I have treated in detail of this excellent measure. Here I can only briefly allude to it, and show its importance for antiseptic midwifery. I do not share the originator's view as to the desirableness of having the placenta removed within a few minutes after the birth of the child. To me the value of Credé's method lies

* Garrigues: The Removal of the Afterbirth, in Amer. Jour. Obst., 1884, Vol. xvii, No. 5, pp. 486-498.

in the fact that the accoucheur does not enter the genital tract at all after the passage of the child, when the mucous membrane and often deeper parts are the seat of fresh wounds, gaping, as it were, to swallow up every microbe that is brought in contact with them.

The expression is performed better in the dorsal decubitus than when the patient is lying on her side, as is customary in England. While I prefer the latter position during the expulsion of the child, for reasons which I have given elsewhere,* immediately after the birth of the child, I turn the patient on her back. The accoucheur stands on the right side of the bed, inserts his eight fingers as far down as they will go on the posterior surface of the uterus, places his two thumbs on the anterior surface, and when he feels the womb contract, he tries, as it were, to squeeze the placenta out of the uterus, at the same time pushing that organ with a moderate degree of force in the direction of the hollow of the sacrum. In the great majority of cases this will suffice to throw the placenta, accompanied by part or all of the membranes, into the bed. If a part of the membranes remain in the genital tract, the usual rope is formed by turning the placenta slowly a few times, the rope is seized between the index and middle finger placed transversely in front of the vulva,

* Garrigues: The Obstetric Treatment of the Perineum, in Amer. Jour. Obstetrics, April, 1880, vol. xiii, No. 2, p. 242.

and slight traction made, alternating with both hands till all is out.

As soon as the after-birth has been expelled or extracted, it is carefully examined to see if it is complete. All agree that to leave any part of the placenta behind is reprehensible. In regard to the membranes, opinions are divided. Some good authorities leave such shreds till they are expelled, but I do not share their view in regard to the innocuousness of these pieces of membrane. Having seen both dangerous post-partum haemorrhage and puerperal diphtheria occur in such cases, I have made it an invariable rule for myself and my pupils, if any part of the after-birth, placenta, or membranes have been retained in the uterus, or even if there be only a reasonable doubt about the complete removal of the after-birth, to introduce two or three fingers, or, if necessary, the whole hand into the cavity of the uterus, in order to scrape off what has been left there. If it has been decided to go in, the operator ought not to be satisfied before he has palpated the whole inner surface, especially the two corners in which the tubes debouch. I even introduce the hand several days after delivery, if there is any reason to believe that something has been retained. I finish, of course, with an intra-uterine douche (1:4000) of bi-chloride of mercury, and I have never seen the slightest trouble arise from this treatment.

ERGOT.—The possibility of being obliged to introduce the hand into the uterus after delivery is

one reason why ergot should never be used before it is sure that the uterus is empty. Then I use it as routine treatment, giving a drachm of the fluid extract immediately after delivery, and half that amount three times a day during the first few days. By ensuring powerful tetanic contraction, this drug closes the veins, favors the formation of thrombi, and places in this way a barrier to infection, which, if it is not insurmountable, is still of sufficient importance to give ergot a legitimate place in a treatise on antiseptic midwifery.

If it becomes necessary to examine the inside of the uterus after the administration of ergot, it is often very difficult, and sometimes impossible, even under chloroform, to pass the whole hand into the cavity of the body, but by putting the three middle fingers into the uterus, keeping the remainder of the hand in the vagina, and pressing the fundus well down, the whole inside may be touched and scraped.

LUBRICANTS.—For all common examinations the use of lubricants is superfluous, and most substances used as such, for instance, oil, fat, butter, vaseline, etc., are, to say the least, suspicious in regard to sepsis, especially if kept in the wards of a lying-in hospital. All that is needed to make the examining finger sufficiently slippery for an easy introduction, is the fluid adhering to it after the last disinfecting immersion into the solution of bichloride of mercury. When the whole hand has to be passed into the va-

gina or uterus, a special lubricant becomes necessary, and then I use a three-per-cent. solution of carbolic acid in glycerin, which is as well used for inunction of the forceps. In private practice, if carbolized glycerin is not at hand, plain glycerin, pure olive oil or fresh vaseline may be used.

DISINFECTION OF THE HANDS, THE ARMS AND THE WHOLE BODY.—For common cases it suffices to disinfect the hands, but the physician cannot be too careful in doing so. It is not enough to give them a slight rubbing with soap, as we do in order to look clean, and dip them for a moment in the solution of bichloride. The accoucheur must bear in mind that of all dangers surrounding his patient the greatest lurks in the furrows and creases of his own hands, and that the solution of bichloride is not enchanted water working by magic. He must realize that he may, unknown to himself, carry a subtle poison on his hands which, brought into the genital canal during delivery, may cause his patient's death. The disinfection of the hands is, therefore, of all antiseptic measures the most important, and ought to be undertaken with religious conscientiousness.

At the peril of being taxed with pedantry, I hold it to be my duty in this place to enter into details which may seem self-evident, but, nevertheless, have to be shown to every new pupil I have to deal with. The disinfection of the hands is composed of two acts, the mechanical removal of dirt and epidermic

cells and the chemical destruction of microbes. In Vienna they use the ointment-like green potassa soap* which plays so great a part in the treatment of skin diseases in that school, and since after that they as a rule, only use a 1 to 2-per-cent. solution of carbolic acid, which experimentally has been proved to possess very weak antiseptic properties, I think their soft soap, which sticks to the skin, and which one has great trouble in getting off again, has a great deal to do with the excellent results they obtain. It will not only insure a much more thorough mechanical cleaning of the skin, but possesses considerable antiseptic power.†

In this country that kind of soap is little known, and would probably meet with some objections. It is therefore so much the more important to smear the hands thoroughly all over with the soda soap commonly found, to rub the hands against one another and to scrub them with a stiff nail-brush, which in private practice the doctor must carry in his satchel. Special attention must be paid to the spaces between the nails and fingertips, and to the furrows surrounding the edges and the base of the nail, as these are

* Ehrendorfer, in *Archiv für Gynäkologie*, 1885, Vol. XXVII, p. 218.

† Robert Koch (l. c., p. 271) found that a solution of 1:5000 began to hamper the development of bacilli, and one of 1:1000 prevented it completely.

the most difficult parts of the whole hand to clean. After having thus cleansed the hands with soap and water, the accoucheur ought to repeat the same washing and scrubbing with a solution 1:2000 or even 1:1000 of bichloride of mercury. Finally, the nails ought to be freed from whatever might have resisted the brush, by means of a pocket-knife. This disinfection of the hands takes fully five minutes.

Foerster* has experimentally examined how the hands are best disinfected. He tried all kinds of disinfecting fluids, and put his finger treated with them in a sterilized solution of broth. In the course of twenty-four to sixty hours all sorts of microbes developed in the broth. A solution of 2½ per cent. carbolic acid was not strong enough to prevent their development, but when the solution of bichloride of mercury was used in the strength of 1 to 1000 or 2000, no germs of any kind were found.

In all operative cases, in which the hand is introduced into the uterus, the disinfection must extend up to the elbow.

The accoucheur ought to take off his coat and cuffs, and, in operative cases, to pull up the sleeves over the elbows.

If he has been exposed to exceptionally dangerous material, for instance, if he has been obliged to

* Foerster, in Centralblatt für klinische Medicin, No. 18, 1885.

stay for some time with a patient suffering from erysipelas, diphtheria, or puerperal fever, he ought to disinfect his whole body by taking a bath containing two drachms of corrosive sublimate, wash his hair in the bath, and change all his clothes, which should be fumigated with sulphur before being used again.

DISINFECTION OF INSTRUMENTS.—As all metal instruments suffer more or less by contact with bi-chloride of mercury, and nickelplated ones are entirely spoiled, the instruments are disinfected by immersion and scrubbing with a five-per-cent. solution of carbolic acid.

If Simpson's *axis-traction* forceps is used, it is necessary to have a key, and separate the traction rods from the blades after each operation, as otherwise it is not possible to clean and disinfect the instrument completely.

INJECTIONS.—Honest laborers in the field of antiseptic midwifery disagree as yet as to the rôle preventive injections should play. At times they have been carried to such extravagance, that a reaction could not fail to come soon.

In 1863 every patient delivered at the School for Midwives, in St. Petersburg, had her uterus washed out with a solution of chlorinated lime, two or three hours after delivery, which procedure was repeated several times during the first forty-eight hours,*

* O. von Grünwaldt, in Petersburger med. Zeitschrift, 1863, vol. v, p. 28.

whereas, Fritsch, in his latest publication,* even forbids to administer a vaginal douche before delivery, if the accoucheur gets the case before any other person whose reliability from an antiseptic standpoint is doubtful, has meddled with it.

Having been well pleased for many years with the injection of a one- to two-per-cent. solution of carbolic acid into the vagina, morning and evening, during the first eight or nine days after delivery, in every confinement, I also used these injections as stated above, in Maternity Hospital, when I was appointed Visiting Obstetric Surgeon there in 1881. During my first service of six months, when this routine treatment was followed, there reigned a moderate morbidity and mortality.

During my second term of service, October 1, 1882 till April 1, 1883, they were not used, but in spite of this "non-interference," which has been, and still is recommended by many writers who have not yet been convinced of the inestimable superiority of true antisepsis, the morbidity and mortality increased very much. Those who during the decade from 1870 to 1880, and a little beyond that time, did not use prophylactic vaginal injections, have no right now to boast, because this treatment has been, or rather is being superseded. They were simply behind their

* H. Fritsch: *Grundzüge der Pathologie und Therapie des Wochenhefts*, Stuttgart, 1884, p. 130.

time, for those injections were then used everywhere, by the most advanced obstetricians. And it ought yet to be distinctly understood that preventive antiseptic vaginal injections are by far preferable to the abstention from all antiseptic treatment. Some quite recent authors recommend them warmly. Thus Kucher,* who represents the Vienna school in this city, when he finds lesions or severe contusions of the perineum, the external genitals, the vagina or the cervix, uses injections once a day with a 3-per-cent. solution of carbolic acid, at a temperature of 106° to 110° F. That would seem to be in every primipara since they all, without exception, present some of these lesions. He finds that all contusions and lacerations heal more promptly when injections are given, and that injections into the vagina also are very useful for removing clots from it, and for exciting uterine contractions.

Bondesen† states that from 1873 to 1877 when the antiseptic measures in the lying-in asylum of Copenhagen consisted in disinfection, by means of carbolic acid, of the patient's genitals and everything coming in contact with them from the moment labor began, they had a very low mortality from puerperal

* Joseph Kucher: *Puerperal Convalescence and the Diseases of the Puerperal Period.* New York, 1886, p. 240.

† Joachim Bondesen, in *Nordiskt Medicinskt Arkiv*, 1884, vol. xvi., No. 11.

fever, on an average 1.7 per cent., but a high morbidity, namely, 25 per cent. From 1878 they gave a vaginal injection immediately *after* delivery, and in case of artificial delivery even an intra-uterine injection. Under this treatment the mortality from puerperal fever during the following five years, fell to 0.6 per cent and the morbidity to 13 per cent.

I am, therefore, convinced, both from my own experience, and the observations of others, that vaginal injections are a valuable preventive of puerperal septicæmia. But, on the other hand, it cannot be denied that they have several drawbacks, and therefore an antiseptic treatment that allows us safely to dispense with them is preferable. Injections necessitate the use of a particular apparatus, which increases the expense of the lying-in period, and thus become difficult to obtain for poorer patients. They imply the frequent contact of the fingers of the nurse and of the nozzle of the syringe with the genital tract of the puerperal woman, and the admission of the surrounding air into this canal, by all of which she is exposed to inoculation with septic matter. Even the repeated mechanical disturbance of the wounds constantly found in the genitals after delivery, is likely to retard their healing. Finally, it cannot be left out of consideration that some nicety of manipulation, and, consequently, a comparatively developed intellect and good training are required in the person to be entrusted with the administration of vaginal injections,

all of which is found in a well-instructed professional nurse, but by no means in untaught sisters, husbands, or neighbors, who are all the help the large majority of women have at their command during their lying-in period.

I take it, therefore, to be one of the great advantages of my occlusion treatment that these injections become superfluous. As the dressing protects the genitals against contact with any infecting body, as the genitals are not touched once after delivery with a finger, as the air even is almost constantly excluded or at least disinfected before it can enter the well-closed vulva, there is no call for disinfecting injections in normal cases.

As to the injection *before* delivery, I take it to be an important part of the antiseptic prophylaxis. The vagina is of course as little in an aseptic condition as the skin, and needs disinfection if we will not risk at every examination carrying dangerous substances into the womb. As long as the mucous membrane is intact, they are innocuous, but when, in consequence of the enormous distention and friction caused by the passage of the child through the vagina, this organ becomes the seat of numerous abrasions or deeper wounds, when later the lochial discharge carries the débris from the uterine cavity over it, these substances may invade the system, and cause septicæmia. The previous disinfection of the vagina becomes still more important if it should be necessary to introduce the

hand into the womb, as in version or the separation of an adherent placenta, or even into the peritoneal cavity, as in rupture of the uterus with expulsion of the child into that space.*

But is it possible to disinfect the vagina? It has been said that on account of its folds, the disinfecting fluid does not come into contact with the whole surface. I think this is a mistake. When we give a vaginal injection it is easy to see that we inject a considerable amount of fluid before any of it returns.

The nozzle should be brought quite up to the vault, especially into the depth of the posterior cul de sac, and into both corners corresponding to the upper end of the lateral sulci. When the fluid is let out here, its first effect is to distend the vagina, and smooth out its folds, whereby the fluid is really brought into contact with the whole surface of the mucous membrane.

Another objection that has been made is that the solution of carbolic acid in the strength commonly used, say 2 to 5 per cent., does not kill the micrococci. Much can be said against this argument. Only few microbes can resist a 5-per-cent. solution, and perhaps even a two or three-per-cent. solution is strong enough to kill those which are found in the vagina. Perhaps the mere mechanical removal of a large number of

* Such cases of successful removal of the child from the abdominal cavity *per vias naturales*, under antiseptic precautions, are reported in *Centralblatt für Gynäkologie*, 1880, vol. iv, p. 418 (Frommel); p. 612 (Morsbach); p. 614 (Graefe).

them by the injection is enough to protect the patient against the attempts of those that are left. At best, the argument applies only to the adherents of carbolic acid, whereas it falls to the ground when directed against us who use the much more potent germicide, bi-chloride of mercury, of which we know that a solution of one part to 1,000, and even down to 1 to 5,000, if used in sufficient quantity, will kill all micrococci in a few minutes.

Vaginal injections *after* delivery are quite different from those given before, inasmuch as then the vulva and the vagina are full of abrasions and deeper wounds, which render all manipulations of them with fingers and instruments, and the admission of air much more dangerous. These injections ought, therefore, to be limited to abnormal cases, in which a special treatment is called for, as when it has become necessary to introduce the hand or instruments into the vagina, or when the lochia become foetid, or fever sets in, or other signs and symptoms of infection appear, as indicated above in the chapter on the antiseptic treatment of puerperal infection.

Besides vaginal injections, I have used and continue to use prophylactic *intra-uterine* injections in every case in which it has become necessary to introduce fingers, the whole hand, or instruments into the uterine cavity. The theoretical reason for this is that even when the vagina, the hand, and the instruments are disinfected, it is impossible to avoid introducing

air into the utero-vaginal canal, and, as this air may carry poisonous elements, the parts must be disinfected.

The second indication for the use of prophylactic intra-uterine injections is the birth of a macerated child surrounded by decomposed liquor amnii.

As a curative measure in cases of puerperal infection intra-uterine injections are of the very greatest value, but they are not sufficient if a part of the after-birth has been retained; then their use must be preceded by the manual or instrumental removal of the noxious substance.

The question, how often uterine injections should be repeated, is an important one, and one upon which even quite recent authors disagree very much.

While Dr. Wiley, of this city, would use them every half hour, until the temperature falls to the normal,* Fischell,† the assistant of Breisky, of Prague, declares repetitions of the intra-vaginal douche to be false in principle, and restricts their use in practice to very few cases.

In this respect, I think it cannot be left out of consideration that it is impossible to give an intra-uterine injection without disturbing the patient con-

* W. G. Wiley, in *New York Medical Journal*, 1883, vol. xxxvii, p. 678.

† W. Fischel, in *Archiv für Gynakologie* 1882, vol. xx, page 23.

siderably, and without causing mechanical irritation of the wounds in the genital canal, and perhaps making new ones. On the other hand, I cannot see why new infection should not be able to be caused in the woman whose womb has been successfully washed out once.

At all events it is an observable fact that the high temperature may go down after an intra-uterine douche, and rise again after a few hours, and again be brought down by the repetition of the injection. Since I use my occlusion dressing the interval between the rises in temperature has become much longer than before, and another step was reached by the adoption of Ehrendorfer's iodoform suppositories. Now I mostly find one intra-uterine douche in twenty-four hours sufficient, and have never occasion to give more than two in that time.

For the injection I now use a solution of bichloride of mercury (1 to 4,000) and only two or three pints at a time.

Intra-uterine injections ought always to be given in the dorsal decubitus, in order to prevent the fluid from sinking through a possibly dilated Fallopian tube into the peritoneal cavity.

When the injection is made immediately after delivery the index and middle fingers are introduced into the cervical canal, and the tube carried in between them. During the lying-in period, I prefer to insert the tube through a Cusco's speculum. In that

way it enters with greater ease, and the return of the fluid can be observed much sooner than when the tube is carried in on a finger, and the fluid distends the vagina before it is seen to come out again. I use the above mentioned glass tube, or a tin tube with large opening at the end, or an English gum-elastic catheter. As the cervix is always open and soft in cases of puerperal septicemia, instruments admitting of a double current are superfluous, nay, I take them to be much less reliable, as the fluid may return through the efferent tube without entering the cavity of the uterus. We have even lost a patient by the use of such instruments, the house surgeon, who administered the injections, having by mistake connected the rubber tube through which the fluid came in, with the wider of the two tubes in the double-current catheter. The result was that the womb which, in consequence of dissecting metritis, was in some places as thin as tissue paper, was ruptured.

My tube (Plate, 1) is made of very thick glass, curved like a male catheter. It is twelve inches long, a little over one-fourth of an inch wide, outer measure, and has a large opening at the end and eight side openings, all of which have well-rounded edges, and are placed on the last four inches of the tube. It differs from Chamberlain's by its small calibre, its open end and the greater number of lateral holes. The small calibre I prefer because it enables us to use the same tube any time during the first two weeks, even when

considerable contraction of the internal os has taken place. The opening at the end I take to be necessary in order to be sure to wash out the fundus of the uterus thoroughly, and the larger number of side openings insure the same effect on the sides. The perforated part of the tube being only four inches long, it is entirely within the internal os, which prevents a premature escape of fluid in the cervix.

For use in Maternity Hospital I have had glass jars made (Plate, 2) with hard-rubber fittings. They hold three quarts, and are held in a kind of tin cradle with a scale showing how much solution has been used. The manufacturers refuse to make any more, but some good imported ones can be obtained from Caswell, Hazard & Co.

In private practice rubber fountain syringes are good, but if they are not at hand I often use a Davidson's syringe,* making the connection with my glass tube by means of a bit of rubber tubing.

The jar or fountain syringe ought not to be held more than one foot above the level of the fundus uteri. The Davidson's syringe ought to be worked very slowly, and the fluid is best kept in a bottle or pitcher, in which the sinker stays at the bottom, whereas in basins it is liable to slide up along the

* For the benefit of those not familiar with this instrument I may add that it is essentially the same as the English Higginson's syringe and the continental soft rubber clyso-pompe.

sides, and get out above the surface, so that air might be pumped in.

It goes without the saying that whatever apparatus we use the air should be driven out before we introduce the tube into the uterus. We need not be afraid of provoking hemorrhage as the clots in the sinuses are long, and the hot water produces uterine contraction. If used shortly after delivery the water ought to be so hot that we can just hold the hand in it, or by measurement 110° to 115° F. This causes great pain, but as it is chiefly used under dangerous circumstances, especially post-partum hemorrhage, when action must be prompt, and the use of anaesthetics is contra-indicated, the patient must submit to the pain in order to save her life.

Later in the lying-in period, the fluid used for intra-uterine injections need only be pleasantly luke-warm, about 100° F. Cold fluids are very apt to cause collapse, and ought therefore to be avoided.

In Maternity Hospital, where a very large amount of solution of bichloride of mercury is used, we keep it in the pavillions, in barrels holding about forty-five gallons each. In the pharmacy a solution is made of 1 to 20, and of this seven pints and one-half ounce is mixed with a barrelful of boiled water, which gives the standard solution of 1:1000. From the barrel the solution is drawn into pitchers with an easily recognizable label. The small basins containing the fluid used by doctors and nurses at the bed-side are made

of brown earthenware, and are never used for any other purpose. Cotton that has been used in cleansing or examining a patient, is immediately thrown into a slop-pail with solution, and soon removed from the wards. The dressings are burned.

CONTINUOUS IRRIGATION.—Intra-uterine injections may be said to reach their acme when applied in the shape of "permanent irrigation," as recommended by Schücking.* A thick metal catheter, with the opening at the end, combined with a metal drainage tube with many side openings, and wound all around with gauze, is introduced up to the fundus. The puerpera lies on a bed-pan, or a canvass stretcher with a hole for the nates. The uterus is first washed out with a five-per-cent. solution of carbolic acid, and after that with Minnich's solution, *i. e.*, a solution of ten per cent. of sulphite of sodium and five per cent. of glycerin, which is kept running for six or eight days. The author recommended this treatment both as prophylactic and curative. I have no personal experience with it. As a mere prophylactic, it is out of the question to submit a patient to such a treatment; as a cure, I hold it to be superfluous. If we cannot cure the patient by means of vaginal and intra-uterine douches of bichloride of mercury, intra-uterine iodoform suppositories, and the antiseptic oc-

* Adrian Schücking, in Centralblatt für Gynäkologie, 1877, vol. i, p. 33.

clusion dressing, I do not think we can do so by means of a permanent current of fluid; moreover, the whole apparatus is so complicated, and would meet with so much resistance from the patient and her friends, that I do not feel like trying it.

DRAINAGE OF THE UTERUS.—Another method that may deserve a passing notice, is the drainage of the uterus.* A thick drainage tube, carrying at the upper end a thinner cross-bar, is left in the uterus, in order to "remove every drop of septic fluid." It is used in combination with intra-uterine antiseptic injections. I have no personal experience with it, but think it would be more likely to admit septic substances into the cavity of the uterus, than to deliver it from the last vestige of them.

OTHER ANTISEPTIC DRUGS.—The narrow space left does not allow me to more than hint at other drugs than the bichloride of mercury, which have been or are yet used. By far the most important is *carbolic acid*, which is still used in several institutions, *e. g.*, Vienna and Copenhagen, and there gives excellent results. It would not be fair to say that bichloride of mercury is so much better than carbolic acid as our present results in Maternity Hospital are better than they used to be, since the disinfection of the hands of the nurses and substances brought into contact with

* Schede, in Berliner Klinische Wochenschrift, 1877, No. 23-24.

the patient formerly was not carried out so strictly as now. Still, during labor the same precautions were taken by myself and the house staff as now, and yet our results were very unsatisfactory. The carbolic acid gave occasionally direct trouble by burning the genitals of the patients. The smell of it is disagreeable, and the accoucheur who has much to do with it, carries this tell-tale odor around with him wherever he goes.

Permanganate of Potash is an old disinfectant, and has, in this country, been praised in the treatment of puerperal septicæmia by Chadwick, Sinclair and Goodell.* I have no personal experience to offer on this subject.

Of late the *biniodide of mercury* has been recommended.† Experimentally it has been proved to be a stronger disinfectant than the bichloride, but since the latter is so strong that it has to be used in very weak solutions, that can scarcely be regarded as an advantage. It has so far only been used in a few cases in private practice, whereas the experience in regard to the bichloride comprises many thousand cases treated in hospitals. The biniodide is insoluble in water, and the mixture of the two can only be achieved by adding equal parts of iodide of potassium and

* Trans. Amer. Gynæcol. Soc. 1879, Vol. iv, pp. 119, 123 and 133.

† E. P. Bernardy, Am. Jour. Obst., Oct., 1885, p. 1093.

dissolving it in a small amount of water. It is eight times more expensive, the wholesale price of the bichloride being 75 cents per pound, and that of the biniodide 35 to 40 cents per ounce. Being a stronger disinfectant, only about one half would be used, but that would still make the expense four times greater. It is quite as poisonous as the bichloride. Taking all these points into consideration, I doubt that where large quantities are used it will supplant the latter in obstetric practice.

A substance that, although a weak antiseptic, is occasionally useful, is *boracic acid*. I have used it in protracted cases of dissecting metritis, in which carbolic acid was not well borne. Thomas recommends it for the disinfection of the obstetrician's hair. Since the introduction of the bichloride-occlusion treatment, the dissecting metritis, of which I observed eight cases in the course of a year, has entirely disappeared.

DRESSING.—It has been said that my way of dressing the genitals after parturition is needless.* Maybe it is, but the only evidence that, to my mind, would be a conclusive proof of the correctness of this assertion, would be, if in those same wards of Maternity Hospital, with those numerous doctors and nurses coming from Charity Hospital, with all the other precautions minus the dressing, we would obtain as good results as we have done since the introduction of the

* Kucher, l. c., p. 202.

new system, and who will dare to make the experiment? At all events, I think, we should keep up a treatment that has yielded us such excellent results, for a longer time, before making any change in it.

That the results in Vienna are as good without any kind of application to the genitals, cannot be looked upon as a convincing proof of the needlessness of my dressing. I have not had the advantage of examining the Vienna institute myself, but a friend of mine, who spent six months there, has told me that it made the impression on him, as if the patients could not be killed. It is not said that a treatment which proves sufficient in Austria, would do so here. Our servant girls are used to a luxury that to the ears of their trans-atlantic sisters would sound like a tale from "The Thousand and One Nights," and even poor married people in this rich country, are far from being accustomed to the hardships of the poor population in German cities. A natural consequence of this more refined life is a greater vulnerability and a lesser power of overcoming the effects of a poison that enters the system. It would, therefore, seem quite natural if women who are born here, or who have been living here for some time, needed more elaborate measures to protect them against puerperal infection than the lower class of European women.

Even if Fritsch* should be right in his assertion,

* L. c., p. 49.

that air is innocuous, which, from my own experience, I have every reason to doubt, my treatment has the advantage of keeping such solid infecting bodies as may be found on shirts, sheets, blankets, etc., away from the genitals of the puerpera. As a matter of fact I would state that I have not had a single one of the so-called late cases (see Introduction) since I use the dressing.

Dr. Kucher* teaches not to put anything on the vulva or between the legs. This is certainly better than the traditional napkin, which may directly infect the genitals, but it cannot afford the same degree of protection as a well-applied dressing composed of clean materials and disinfected by means of a powerful antiseptic. It will probably be found more difficult to make people give up their old napkin than to replace it by my more elaborate dressing, which is easily recognized as being evolved from it. Illiterate women, who have not the remotest idea of sepsis and antiseptics, have in my practice declared themselves highly pleased with the dressing. "because it was so soft and kept the parts so nicely warm," thus protecting them against a factor which in the general public is looked upon as the cause of nearly all diseases, namely, cold.

I think I may even claim for my dressing a moral effect on the nurses. The careful preparation and

* L. c., p. 240.

exact application of it impress their minds with the importance of their work, accustom them to strict attention to details, and make them even carry out other orders with greater faithfulness.

Another objection that has been made to my dressing by people who have not tried it, is that it must prevent the free discharge of the lochia, and cause the formation of clots in the vagina. As a matter of fact, this is so far from being the case that clots are found much more rarely, and are much smaller than without the dressing, and I think this fact may be explained by the nature of the material used for the pad. This being absorbent, and wrung entirely out before it is applied, must retain a considerable degree of capillarity, by means of which the lochia are sucked out from the vulva.

A decided advantage of my treatment, is the absolute absence of smell. The sickening odor characteristic of the lochial discharge, and which is by no means improved by its combination with the fumes of carbolic acid, is unknown with my treatment. Even in a ward with nine puerperæ the air is as pure, sweet and odorless as in the best aired private parlor. In private practice, refined ladies appreciate this deodorizing power of the dressing very highly.

The local effect of the bichloride is to impart a whitish hue to the skin and a bright scarlet color to the blood. Abraded surfaces appear sometimes covered with a thin sulphur-colored layer of inspissated

pus. Mucous membranes lose somewhat of their slipperiness, but not enough to make it a serious argument against the use of a treatment that preserves life and health to a hitherto unknown degree. Very rarely patients complain of a little smarting, and still more rarely I have observed a slight eczema on the vulva and the inner surface of the thighs, both of which conditions disappear after the application of a little glycerin.

POISONING.—A much more serious question is how the bichloride affects the system in general?

Thirteen cases of poisoning, four of which ended fatally, have been reported in Germany and Denmark,* and a fifth fatal case has occurred in the Nursery and Child's Hospital of this city.† The narrowness of the space at my disposal does not allow me to enter into the details of these cases, but they present some features of such great interest, that I cannot forbear pointing them out. In Lomer's case‡ a complete rupture of the perineum was stitched up under irrigation with a 1:1000 solution. In Stadfelt's

* O. von Herff, in *Archiv. für Gynäkologie*, 1885, Vol. xxv, No. 3, p. 487.

† E. L. Partridge, at the meeting of the Obstetrical Society, held on June 3d, 1884, reported in the *Am. Jour. Obst.*, April, 1885, p. 405.

‡ *Zeitschrift für Geburtsh. u. Gynäk.*, 1884, Vol. x, No. 2, p. 351.

case * severe abdominal pain, headache, and constriction of the throat occurred during the injection of a a 1:1500 solution into the uterus. In Vöhtz's case † a stiff syringe, an English catheter and a solution of 1:750 were used. As in the preceding case, intense abdominal pain occurred during the injection. Winter's patient ‡ had eclampsia, was delivered by forceps, had a post-partum haemorrhage, four or five litres of a 1:1000 solution were injected into the uterus, and two litres were poured over the torn perineum while it was being stitched up. In Partridge's case a solution of 1:2000 was used for vaginal and intra-uterine injections.

It will be seen that in all of these cases rather strong solutions and in some of them enormous quantities were brought into contact with the interior of the womb or large wounds in the external genitals. As soon as these cases came to my notice, I changed the treatment so far as to use only a 1:4000 solution for intra-uterine douches in all cases, and for vaginal douches when there are large wounds in the vagina. The quantity injected at one time was reduced to two or three pints. This strength and this quantity would seem to be all that is required.

* Centralblatt für Gynæk., 1884, No. 7, p. 101.

† Hospitals-Tidende, May 28, 1884, 3d series, Vol. ii, p. 557.

‡ Zeitschrift für Geburtshilfe und Gynæk., 1884, Vol. x, No. 2, p. 437.

The experiments of Koch have proved that the anthrax bacillus, the toughest of all, is killed by immersion in a 1:1000 solution of bichloride of mercury for a few minutes, and that even with a solution of 1:5000, a single application will in most cases suffice.* In obstetrics we have only to deal with the round, chain-forming bacilli, which seem to be the true cause of puerperal septicæmia, with the racemose pyogenic staphylococci, and with the common rod-shaped bacilli of putrefaction. On the other hand, we have not the affected surfaces submerged all the time in such a way as when an experimenter puts bacilli into a test-tube, and fills it with solution. Since now we have been taught by the sad experience of others that our patient's life may be endangered or even lost by absorption of the bichloride, we ought not to use stronger solutions, or a greater quantity than needed for the purpose of killing micrococci, but it may be necessary, on account of the circumstances indicated, in practice, to make the solution a little stronger than what has proved sufficient in laboratory experiments. Thus I have been brought to use the 1:4000 solution where there is any danger of absorption. As in anæmic patients the absorption will be favored by the condition of the tissues, special care ought to be taken in using the bichloride in these cases, and since the bichloride

* Koch, in Mittheilungen aus dem kaiserlichem Gesundheitsamte, 1881, vol. i, p. 277.

affects the kidneys, causing nephritis and calcareous deposits,* it may be wise to refrain altogether from injections with this drug when the patient suffers from kidney disease, and substitute one of the other anti-septic drugs, such as carbolic acid, or the permanganate of potassium.

To banish altogether a drug that in most places has given much better results than any other, because a few deaths have occurred under an exaggerated or careless use of it, seems to me unwarranted. If even all the five deaths had been unavoidable, which probably they were not, that would be a small number compared with those who have been protected against or saved from puerperal septicæmia by this potent drug. Hundreds of cases of death have occurred under the use of ether and chloroform, and still neither doctors nor patients would be without these dangerous friends.

During an intra-uterine injection, the hand ought to be kept on the fundus, and after the withdrawal of the tube the uterus ought to be squeezed in order to expell the fluid remaining in its cavity. It is not even safe to leave any appreciable amount of fluid in the vagina, such as will stay there when the patient lies on

* Prévost: Étude expérimentale relative à l'intoxication par le mercure, calcification des reins parallèle à la décalcification des os, in Revue médicale de la Suisse romande, 1882, No. 11. Centralblatt f. Gynäk., 1884, p. 230.—Fr. Dahl, ibid, p. 195.

her back. To introduce a finger and pull open the entrance to the vagina, as some recommend, seems to me a dangerous procedure, especially when done by nurses. I advise simply to turn the patient over on her side, when the fluid will run out of itself.

I myself have not seen a single case of serious poisoning, and among the more than 1400 cases that have been treated with bichloride in Maternity Hospital, there has not been a single one. None of the numerous patients who have received an intra-uterine injection immediately after delivery, and none of the still much larger number of patients who have been treated in the common wards with vaginal injections three times a day, or even every three hours, have shown the slightest symptom of mercurial poisoning. Nor has this been the case with the house-staff or the nurses, who for months have their hands in the solution a large part of the day, and not even with the head nurse, who has occupied her position ever since bichloride was introduced. The only symptoms I have met with, have been in patients who, on account of puerperal infection, were removed to the sick ward, and treated with intra-uterine douches once or twice in twenty-four hours, and vaginal injections every three hours. A few of these have had bloody diarrhoea and tenesmus, which have been stopped by substituting for the bichloride a 2½-per-cent. solution of carbolic acid, and giving an enema of starch and tincture of opium. As the disease

itself often attacks the intestine it is doubtful if the diarrhoea is to be attributed to the bichloride. Only one had a blue line on the gums, soreness and salivation.

Similar reports come from other lying-in institutions. Thus Tænzer,* assistant physician to the Royal Gynecological Clinic in Breslaw, states that of 628 patients treated copiously with a 1:1,000 solution of bichloride, only four showed symptoms of poisoning which soon disappeared after the discontinuation of the drug, and Bar† reports that for the last two years bichloride has been used for vaginal and intra-uterine injections in Tarnier's service in Paris, and that no case of poisoning has been observed.

On the other hand, carbolic acid, if it has not so far as I know caused any death, has at least given rise to very alarming symptoms of poisoning.‡

The symptoms observed in cases of acute poisoning with bichloride in lying-in women, were abdominal pain, tenesmus, stinking diarrhoea with or without blood, diminished secretion of urine, albuminuria, hyaline casts in the urine, perspiration, low tempera-

* Tænzer, in Centralbl. für Gynækol., 1884, vol. viii. page 487.

† Bar, Des méthodes antiseptiques en obstétriques, p. 54, quoted by Tænzer.

‡ Mäurer in Centralblat f. Gyn., 1884, vol. viii., p. 258.
—Veit in Berliner Klinische Wochenschrift, 1879, No. 3.

ture, frequent, small pulse, vomiting, restlessness, choking, thirst, redness or blue color, soreness and swelling of the gums, loosening of the teeth, metallic taste, ulcers in the mouth, vagina and rectum, gangrenous sloughing of the mucous membrane of the mouth, erythema, headache, collapse and death.

The chief changes found at the autopsy were extensive ulcerations of the mucous membrane of the large intestine, swelling of the cortical substance of the kidneys, calcareous deposits, both in the convoluted and the straight tubules, and dryness of the brain.

WOUNDS.—With my antiseptic occlusion dressing, it is not necessary to do anything for the wounds which, especially in primiparæ, are inseparable from child-birth. When examined ten days after delivery, they are found nicely healed.

This applies even to moderate tears in the perineum. By tying the knees together I have found that they heal nicely by agglutination. In such cases I wait till the fourth day before an aperient medicine is given, and after that I give enough to ensure one easy passage in the twenty-four hours. Castor oil, two to four fluid drachms, if it can be taken and retained, is preferable to any other medicine. If not, a heaping teaspoonful of compound liquorice powder, four ounces of Hunyadi water, or a pill with half a grain of podophyllin and a quarter of a grain of the alcoholic extract of belladonna, etc., may be substituted.

When the perineum is considerably torn, we

cleanse it with a solution of bichloride (1:2000), insert silver sutures, and before closing the wound, we dust the whole surface with iodoform powder.

A convenient knee-binder (Plate, 5) is made of a piece of muslin half a yard wide, and folded so as to be eight inches from above downwards after it is applied. It is pinned around the knees after having placed a thick pad of cotton between them, and it is kept in place by "suspenders," narrow muslin strips running on the outside of the thighs, up to the belly-binder (Plate, 6).

Great care should be taken in hospitals to avoid infection during perineorrhaphy, for most of our septic cases have been patients in whom a lacerated perineum had been stitched.

Formerly, in hospital practice, only about one-half of the cases healed, while under my antiseptic dressing almost every case heals, just as in private practice.

I have tried *serres-fines* in cases of moderate lacerations, and found them work well under the dressing, the soft cotton folding itself round the small clamps. In private practice they will often be found preferable to sutures.

For further particulars in regard to the perineum I may refer the reader to a previous publication on this special subject.*

* Garrigues: The Obstetric Treatment of the Perineum, in American Journal of Obstetrics, vol. xiii, No. 2, April, 1880.

CATHETERIZATION.—It is against the principles of antiseptic midwifery to draw the urine under the bed-cover. The parts ought to be exposed to view, and wiped off with a little absorbent cotton wrung out in the solution. Otherwise, vaginal mucus, or lochial discharge is easily brought into the bladder, where it is apt to produce cystitis.

In hospital practice none but metallic catheters should be used, and constantly kept in a five-per-cent. solution of carbolic acid.

In private practice, if the catheterization has to be left to unskilled persons, it is often better to have it done by means of a gum-elastic or rubber catheter, Davis' "open-mouthed," with the opening at the end, being the best I know of. It is perhaps well to call attention to the two blind recesses, found one on either side of the meatus, as they can be seen under all circumstances, and thus may serve as land-marks.

SYRINGES.—In hospital practice each patient should have her own vaginal and rectal glass tube, which are carefully disinfected with bichloride of mercury. In wealthy private practice, it is best to have a new syringe, but old or new, it ought to be carefully disinfected before being used. As it is desirable to touch the surroundings of the genitals as little as possible, I prefer aperient medicines to enemas, and use the latter only with special indications.

Micturition and defecation will, as a rule, take place at the regular times for changing the dressing,

and, of course, before the ablutions. If they occur at any other time, an extra ablution with solution of bichloride is to be made, and a fresh dressing put on.

COST OF MATERIAL IN HOSPITALS.—Even from an economical standpoint, hospitals will find the anti-septic treatment to their advantage. Oiled muslin may be bought of W. B. Lawrence, 96 Spring St., for \$1.65 per roll, each roll containing five yards, and being one yard wide; absorbent lint, of Seabury & Johnson, 21 Platt St., for 52 cents per pound, a pound package measuring eighteen inches in width, and seven and one-third yards in length; and absorbent cotton, of the same firm, for 48 to 52 cents a pound, according to the amount taken at a time.

The four dressings for each patient in Maternity Hospital cost between 9 and 10 cents per day. In a large institution this will, of course, amount to a considerable sum at the end of the year. Still, this expenditure is more than covered by the saving on quinine and whiskey, the two staple remedies for sick puerperæ. The corrosive sublimate is likewise considerably cheaper than carbolic acid.

CLINICAL INSTRUCTION.—One great advantage of strict antisepsis is that clinical instruction in midwifery, without which it is hardly possible to learn this most important branch of medical practice, can be given without any great increase in risk to the patient. In Vienna every parturient woman is examined by three students, and in the small German universities,

where the material is scant, by a much greater number,* and still their results, both as to morbidity and mortality, are in many of them satisfactory.

RELATIONS OF ANTISEPSIS TO GENERAL PRACTICE.—Another great advantage is that strict antiseptic treatment allows a general practitioner to attend to midwifery cases even when he has to treat infectious diseases. Formerly it was made a duty incumbent on every accoucheur to abstain from other confinements when he had a case of puerperal fever, and likewise to refuse obstetric cases when he treated patients with scarlet fever, diphtheria, erysipelas, and other zymotic diseases. Possibly this was done once in a while by physicians occupying exceptional positions, and in regard to patients in whom they took a particular interest. That it is utterly impracticable for the vast majority of physicians who live by their practice, and in localities where there is no choice of physicians, is so evident, that it would be waste of time and space to dilate on it. But the difference is, that without antiseptic precautions the physician exposes his patient to a great danger, which he avoids by following the above precepts.

INFLUENCE ON THE CHOICE OF OPERATIONS.—Such a thorough antiseptic preventive treatment as we now possess, cannot be without influence on the choice of operations. After the invention of the ob-

* Ehrendorfer, l. c., p. 221.

stetric forceps, that instrument to a great extent supplanted podalic version, and rightly so since it became apparent that forceps operations gave better results. It was a fact that could not escape the attention of obstetricians, that the introduction of the hand into the womb very often led to serious illness and death of the patient, and this applied most of all to the artificial removal of the placenta. With our present knowledge of the origin of puerperal septicæmia, we understand perfectly well that it could not be otherwise. As long as no antiseptics were used, it is easy to see that the danger from infection was the greater the deeper the hand was introduced, and greatest of all when the fingernails were used to make a more or less artificial line of demarcation between the placenta and the uterus, scraping off remnants of the former from the inside of the latter. With the antiseptic precautions now at our command it has become perfectly safe to operate in the interior of the womb. Turning may therefore now again be had recourse to oftener than before, and we certainly ought never to take the risk of leaving any part of the afterbirth behind. As soon as there is a reasonable doubt whether all of it has come away or not, the whole interior surface of the womb should be palpated, and whatever may be found, should be removed.

CHAPTER VI.

ANTISEPTIC TREATMENT OF MASTITIS.

The modern teaching being that mastitis is due to an infection said to take place either through a sore nipple, or through the lactiferous ducts, this troublesome disease comes within the scope of this little treatise.

During the earlier part of my service at Maternity Hospital, I was struck with the common occurrence of mammary abscesses. At that time, sore nipples were treated with compound tincture of benzoin; the breasts were much rubbed and kneaded by the nurses; and mammary abscesses were treated with linseed meal poultices, before and after incision.

On the 1st of October, 1882, I introduced a radical change in this whole treatment. The use of breast-pumps, rubbing and kneading were totally discarded, and excoriations of the nipples were exclusively treated with dry tannin. This forms with the secretion of wounded surfaces a kind of scab, which adheres so intimately to the underlying surface that it cannot be entirely washed away, but before nursing the nipples are washed with luke-warm water, in order to remove as much of the tannin as will come off. After nursing, the nipples are again washed, the superfluous water removed by the application of dry absorbent

lint or cotton, and new tannin is dusted on. Besides this, the nipples were protected from mechanical injury during nursing by means of the common soft rubber shields. When the nipple was very sore lactation was suspended for from twelve to thirty-six hours, or even a few days, but the rule is to keep the breasts well drained by one or even two babies.

If a breast became tense or "caked," an even compression was applied to it by means of a binder just broad enough to cover the breasts.

By this treatment the number of sore breasts diminished considerably, but by a gradual evolution, which I believe is mostly due to the skill of Miss Murphy, our thoughtful head-nurse, it has now reached such a degree of perfection that *mastitis has entirely disappeared from the hospital*. During my last term of service, from September 1st, 1885 till March 1st, 1886, 236 women were confined, and we had not a single case of abscess. In the vast majority of patients the breasts were perfectly normal except excoriated nipples. In a few cases there was a beginning inflammation which never went beyond a little redness, tenderness and swelling on a circumscribed area, all of which symptoms disappeared in a few days by a tighter application of the breast-binder.

This heretofore, to me, unknown absence of mammary abscesses is obtained in the following way: When the breasts begin to swell, say on the third or fourth day after confinement, the whole chest of every

patient is covered with a *breast-binder* (Plate, 7) a kind of jacket made by taking half a yard of muslin, one yard wide, cutting out a small segment corresponding to the nape of the neck, and a larger pear-shaped piece for each arm. The breast-binder is placed under the patient's back down to the waist, where it meets the belly-binder, both breasts are brought well upwards and inwards, a piece of cotton batting is inserted between the breasts, the patient holds these herself while the nurse draws the ends of the binder rather tightly together and fastens them in the middle line with a row of pins, going from below upward. At the upper end a V shaped opening is left free, and each anterior flap brought up over the shoulder and pinned together with the corresponding short flap of the posterior part of the binder. Thus the breasts are lifted up and evenly compressed. If there is a superabundance of milk, the binder is tightened so much more. In such cases a small hole is cut in it corresponding to the nipple, so that the pressure is kept up without interruption. In common cases, when the child is to be applied to the breast, the upper part of the binder is opened in the middle line, and pinned up again as soon as the child has finished.

In private practice, I cut this breast-jacket and put it on for the first time myself. Afterward the nurse or any female friend can do it.

The breast-binder is only used for four or five days, except in the rare cases referred to above, in

which there is a beginning inflammation. Under such conditions it is immediately put on again, and this time quite tightly.

If there be considerable pain, or the skin be red, an ice-bag is applied over the bandage, corresponding to the affected parts.

In our hands this treatment has so far proved an absolute preservative against mammary abscesses.

This is a clinical fact to which I call the attention of all obstetricians. How the adherents of the theory that mastitis is always due to sore nipples will reconcile it with that view, I leave to them. But this theory has already undergone divers modifications, and in the latest article that has come to my notice,* I find, besides a careful study of the different species of microbes concerned in the production of mastitis, their different modes of invasion, and the different clinical conditions produced by them, the old clinical fact rehabilitated that stasis of the milk is a factor of great importance in the production of mammary abscesses. It may be, then, that our dry tannin works by closing small sores, and that our jacket facilitates the evacuation of all the lactiferous ducts. The chief thing, however, is that independent of all theories they prevent mammary abscesses.

If the breasts are treated in other ways, or not

* E. Bumm: *zur Ätiologie der puerperalen Mastitis*, in *Archiv für Gynäk.*, 1886, Vol. xxvii, No. 3, p. 480.

treated at all, the inflammation is very apt to terminate in suppuration, when again antiseptic measures can do a great deal of good. To incise and apply a poultice is very bad treatment. The public, it is true, is delighted to see how the poultice "draws all the bad stuff out," but the fact is that by the moist heat of the poultice we do all we can to favor the proliferation of the cells which go to form the pus. Pus may be formed in the connective tissue under the skin, in the gland or between the latter and the thorax. If we leave the case to nature or wait long before giving an outlet to the pus, the abscess acquires unnecessarily great dimensions, and may burst outward or into the pleural cavity. As soon as fluctuation is felt, or pus is discovered by aspiration with a hypodermic syringe, the abscess ought to be opened. For this purpose the breast is carefully washed with soap and water, and a solution of bichloride of mercury (1:2000), and the instruments are disinfected with a five-per-cent. solution of carbolic acid. If the abscess is subcutaneous, as a rule, one incision will suffice. This ought to be made in the direction of a radius from the nipple to the periphery, as in that direction the edges will gape less after evacuation. It ought to lie either entirely within or entirely without the areola, as otherwise the pigmentation may follow the incision, and give rise to an unpleasant disfigurement of the breast.* If the

* W. L. Richardson's case in *Trans. Amer. Gynec. Soc.*, 1876, Vol. i, p. 165.

abscess is situated in the gland itself 2 or 3 openings are required, but they need only be one-third of an inch long. They ought to be made in the direction of a radius, in order to avoid cutting lactiferous ducts. A bundle of horsehair previously washed with soap and water, and disinfected with bichloride (1-1000) or carbolic acid (5 per cent.) is carried from one opening to the other by means of a fenestrated probe, and the ends tied together. This is an excellent drain, and ought to be left in till all secretion of pus has ceased.

In the subglandular abscess a longer incision, say about one inch long, is made at the circumference of the breast, at the lowest point outwards and downwards. If no counter opening is called for, a rubber drainage tube should be pushed in as far as it goes.

Wherever the collection is, the cavity ought to be syringed immediately after opening it with a solution of bichloride of mercury (1:2000), and then the whole breast covered with large pledgets of absorbent cotton wrung out in the same. Outside of the cotton comes oiled silk or gutta-percha tissue, and finally the above described breast-binder. This dressing is changed once in twenty four hours, and even a large abscess will heal in a few days or a week.

CHAPTER VII.

ANTISEPTIC TREATMENT OF OPHTHALMIA NEONATORUM.

So far as I know, I was the first in this country to publish the results of a large personal experience with Crédé's method of preventing ophthalmia neonatorum.*

As soon as possible after the cord has been cut the outer surface of the eye-lids is washed with plain water. Next, they are slightly separated, and a single drop of a 2-per-cent. solution of nitrate of silver (gr. x to $\frac{3}{4}$ i) is instilled, by means of a solid glass rod or a squirt, on the cornea. In private practice when working without assistance, I have sometimes found it impossible to open the eye-lids sufficiently with the fingers of my left hand. I then merely deposit the drop on the edge, and after having laid the squirt aside, it is very easy to separate the eye-lids with both hands, when the drop sinks down on the bulb, and is carried all over by a few movements of the lids with the fingers.

I introduced this method on the 14th of October, 1882, in Maternity Hospital, and kept it up till I went

* Garrigues: Prevention of Ophthalmia Neonatorum, in American Journal of the Medical Sciences, October, 1884, vol. lxxxviii., p. 443 *et seq.*

off duty at the end of March, 1883. After that time it was discontinued, but during my following terms of duty I have followed the same plan. During those periods 554 living children were born, and only one single case of ophthalmia neonatorum occurred among them. This was a face presentation, and the mother, a negress, was suffering from syphilitic roseola and a profuse yellowish discharge from the vagina. The child developed diphtheritic conjunctivitis and keratitis, was transferred to the eye ward of Charity Hospital, and returned cured in two weeks.

Thus, this treatment may be regarded as an *almost absolutely sure preventive* of ophthalmia neonatorum, a disease that is so common, and so disastrous, that about one-half of the inmates of the institutions for the blind owe their fearful calamity to its ravages.

When the treatment was discontinued, and nothing done, or a milder solution of nitrate of silver used, the disease reappeared in the hospital, so that in the course of time it has been adopted by all the visiting surgeons, and may now be regarded as the established treatment in the institution.

I have never seen any untoward accident due to this treatment. In a few cases there is a serous, and in still more exceptional cases a sero-purulent discharge from the eyes. For the first no treatment is necessary, as it disappears spontaneously in a day or two. For the second, we let a stream of saturated solution of boracic acid flow into the eye whenever the

pus accumulates, and in a few days the eyes are no longer inflamed.

The results obtained by this method in lying-in hospitals are so striking that there cannot be any doubt about the advisability, nay, the duty of adopting it in all such institutions, but whether it ought, likewise, to become the routine treatment in private practice, is yet an open question. In private practice the ophthalmia neonatorum is a comparatively rare disease, and the physician might be blamed if it should happen that the eyes became inflamed, as we have seen them do in some cases. If it is known that the father or the mother has had a gonorrhœa, it is better to protect the child against possible infection by the instillation of nitrate of silver. Again I take this precaution to be advisable in families in which a child, if its eyes became affected, would not be likely to receive proper care, and where an increased doctor's bill would be a calamity, or result in a loss of time to the physician.

In private practice I prescribe gr. j to 3 j of distilled water, which is practically the same strength.

If once the eyes are affected, the same strong solution of nitrate of silver may be used to great advantage to paint over the inside of the swollen eyelids once, the superfluous caustic being neutralized by means of a solution of chloride of sodium (table-salt). The eyes ought to be washed out with a saturated solution of boracic acid as often as the pus reaccumulates.

lates, sometimes every quarter of an hour. Besides this they are covered with small compresses kept on ice. If the cornea is affected the pupil is dilated by the application of one drop of a one grain to the ounce solution of sulphate of atropia every six hours.

In the later stages of the conjunctivitis I have often found it useful occasionally to touch the swollen membrane with sulphate of copper in substance, to use one drop of a weak solution of nitrate of silver (gr. $\frac{1}{2}$ to $\frac{3}{4}$ j) three times a day, and to dip the compress into some warm aromatic infusion, for instance, chamomile tea, instead of ice-water.

CHAPTER VIII.

TREATMENT OF THE CORD.

Special antiseptic dressings have been proposed in order to avoid infection through the navel string. As we have not experienced the slightest trouble from this cause, I have not made use of them. But the old way of leaving a piece of the cord three inches long attached to the child, and to wrap it up in a rag smeared with oil or some other greasy substance, is not so good as the one I have been using for the last year or two. I tie the cord at the distance of barely one finger's breadth from the abdomen, cut it off near the ligature and cover it with dry, absorbent cotton, which comes off in the bath. Then the stump is again dried by pressing new absorbent cotton against it, and surrounded with a pledget of the same. By this dry treatment the cord withers more rapidly, and the shortness of the stump, by diminishing the leverage, prevents mechanical injury to the navel.

SUMMARY OF PREVENTIVE MEASURES.

I. PREVENTION OF PUERPERAL INFECTION.—If possible, the patient should take a full warm bath at the beginning of labor.

Give an enema of a quart of soap suds.

Have half an ounce of bichloride of mercury divided in sixteen powders.

Pour one powder into a quart bottle, add a little hot water, shake, add alternately cold and hot water, till the bottle is full; shake well. This is the standard solution of 1:1000.

Scrub your hands, and for operative interference, your arms, with soap and water, using a stiff nail brush, and then scrub them again with solution. Use special care for the space under the nails, and at their root. Clean your nails with a pocket-knife.

Place beside the patient's bed a basin with solution (1:2000), in which you hold your hand, and everything that comes in contact with her genitals, for at least one minute, immediately before touching her.

Wash the patient's abdomen, buttocks, thighs, and genitals, with solution (1:2000), and if she is not clean, scrub the parts first with soap and water. Inject a quart of the same solution into the vagina.

Use no lubricant, except when the whole hand has to be introduced. Then use carbolized glycerin —three per cent.

Examine rarely, and do not introduce your finger inside the os in common cases.

When the presenting part begins to open the

vulva, cover it with a compress wrung out in solution (1:2000). Likewise after the child is born.

Express the placenta by Credé's method.

If after delivery it has been necessary to introduce your fingers into the vagina, or if during delivery manipulations have been performed in this duct, inject from a pint to a quart of luke-warm solution (1:2000).

If fingers, hands or instruments have been introduced into the cavity of the womb, or if the child is macerated, give an intra-uterine injection, of two to three pints of hot solution (1:4000).

Wash the patient with solution (1:2000).

Put on a belly-binder and antiseptic occlusion dressing.

Change the dressing every six hours in hospital practice, or three times daily in private practice.

Let the patient at the time of changing use the bed-pan, and, after that, run a stream of luke-warm solution (1:2000) over her genitals and neighboring parts.

No vaginal injections in normal cases.

Disinfect instruments with a solution of carbolic acid (five-per-cent.).

If any lubricant is called for, smear them with a carbolized glycerin (three-per-cent.).

II.—PREVENTION OF MASTITIS.—Dust sore nipples with dry tannin.

Apply the binder when the breasts fill up.

III.—PREVENTION OF OPHTHALMIA NEONATORUM.—Wash the eyelids with water. Let fall one drop of a two-per-cent. solution of nitrate of silver (gr. x to $\frac{1}{2}$ i, or, in private practice, gr. i to $\frac{3}{4}$ i) on the cornea.

